LITTLE RED HEN L.B.S.C.

THE MODEL ENGINEER

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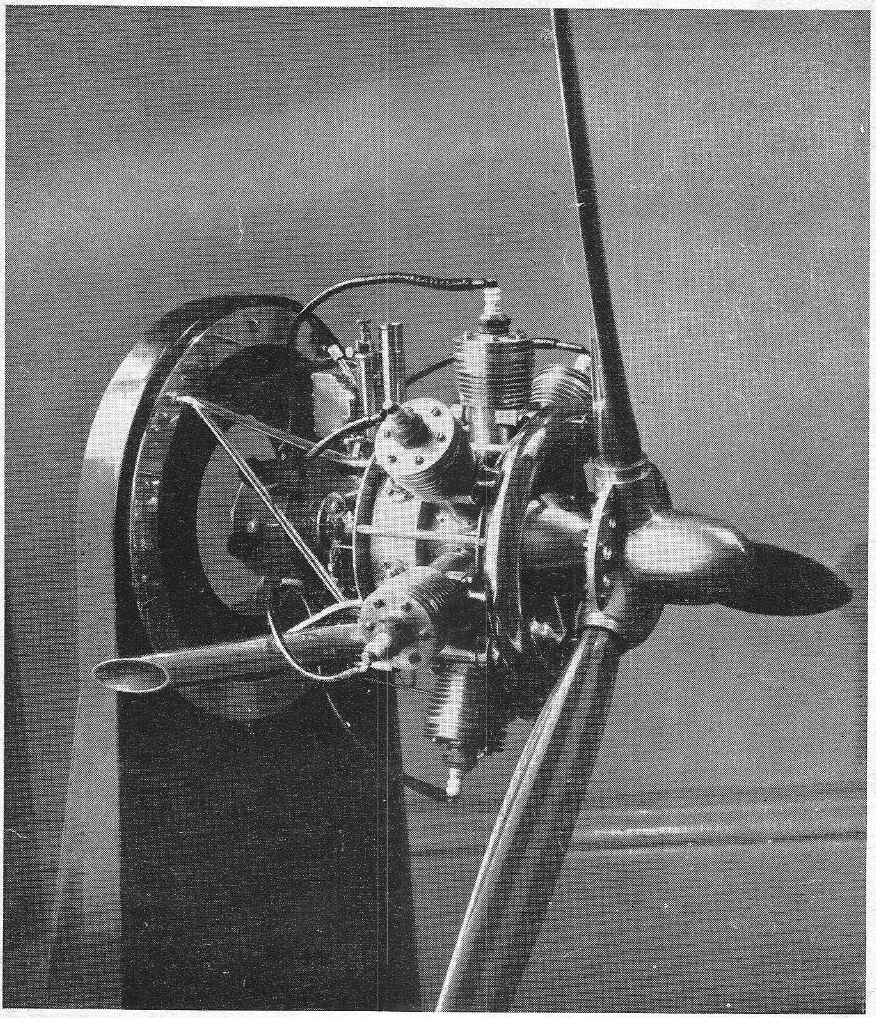

A splendid miniature 7-cylinder aero-engine on pedestal; built by Dr. Thomas Fletcher, of Bradford

THE MODEL ENGINEER

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Smoke Rings

Returning to the Fold

A LINE of welcome to two old friends who after many years are rejoining the happy band of THE MODEL ENGINEER readers. Mr. Arturo Gandolfi, of Turin, reminds me that he was a subscriber and a contributor forty-five years ago, and having learned that THE MODEL ENGINEER is still published, desires to resume contact. From New York, Mr. David Marr, having been out of touch for several years, renews his subscription. Before the war he built a "Fayette," and a half-inch scale B. & O. "President" class locomotive. He writes: "I am now ready to go back to my hobby and THE MODEL ENGINEER is a very important item in model construction. I was a subscriber since the first number, and have Volumes I, II, and III with me. It is interesting to review the progress you have made with your enterprising magazine."

Encouragement at Rotherham

I AM pleased to hear that the Rotherham College of Technology Engineering Society, a professional body, founded in 1904, has just launched a model engineering section. The new section started off with an excellent exhibition in the College, on January 5th, and I am informed that the College authorities have given the section the use of the magnificently equipped engineering workshop for their own use one evening a week. together with the supervising service of a member of the engineering staff. A room in the College has also been provided for the ordinary meetings. The movement has the support of the Education Department of the County Borough Council, and Mr. A. Varty, M.I.Min.E., has been elected President, with Mr. W. H. Tunnicliffe as Honorary Secretary. I congratulate the parent society and the authorities on this admirable encouragement to model engineers, which should do much to develop both handicraft, skill and inventive talent. It is a lead which I hope other technical colleges will follow in a similar spirit of sympathy and practical assistance.

From Models to Shipbuilding

LIKE many other model engineers, Mr. Herbert J. Rees, of Calgary, found his normal business interests severely dislocated by the needs of war-time service. Being an ex-marine engineer, he turned his thoughts and his technical ability to shipbuilding, and this is what happened. He writes: "I moved from Calgary to the Pacific coast at the very beginning of the war to assist in some small way with the shipbuilding programme here. Altogether we built more than 200 ships of various types and sizes in the three Canadian ports on the Pacific coast, viz., Victoria, Prince Rupert and Vancouver, and my job was such at times, that I had several copies of THE MODEL ENGINEER lying on my desk unopened. This will give you a hint as to how busy we were, and how little spare time we had, for as a general rule, I reach for "Ours" the minute I see it and devour the wonderful information found within its pages from cover to cover, including the Ads. In short, I can assure you that my whole life was more or less out of step with ordinary living during most of this serious time, when THE MODEL ENGINEER goes unread for so long a time. Many a time have I arrived home with some problem on my mind, something more or less difficult to overcome in my everyday work, but on more than one occasion I have reached for the current copy of "Ours," and lo and behold, there is the answer to all my worries right in front of me. Yes, the article might be dealing with something in the miniature line, but, very often, I have found it applicable to full-size practice in every sense." Mr. Rees was well known in Canada for his instrument making and precision work, and as an agent for the Stuart-Turner productions. He is now resuming his activities at 6325, Marguerite Avenue, Vancouver, B.C.

Exhibition Expenses

A CORRESPONDENT puts forward a point which may be worth consideration by those organising model exhibitions. He says that in his experience many "lone hands" are deterred from sending in their models by reason of the cost of packing and transport. This applies particularly to those at a distance from the place of the exhibition to whom the prospect of obtaining a small monetary award in a competition, an uncertain prospect at best, is an unsatisfactory set-off against the expenses of sending the model. My correspondent says that most club exhibitions show a comfortable surplus at the finish, and he feels that some tangible allowance to competitors to cover their out-of-pocket expenses would lead to a larger and more representative entry.

Percival Marshall

"The Little Red Hen"

By "L.B.S.C."

ONE of the most popular locomotives for which I have given fully detailed instructions and illustrations was a $3\frac{1}{2}$-in. gauge version of the Stanier type 2-6-0s of the L.M.S. which I called "Princess Marina." Apart from the many locomotives of that type built exactly to the "words and music," there have been many others of similar pattern which have incorporated the principal working parts and dimensions, but differed in details and personal appearance, according to the tastes and nationality of the builders. Readers may remember the fine engine built to Swedish outline by Mr. Arvid Ohlin, of Stockholm; and here is another, built by Mr. Carl A. Purinton, of Marblehead, Mass., U.S.A., the energetic secretary of the American Brotherhood of Live Steamers. She was christened the "Little Red Hen" by Ed. Leaver, who doesn't need any introduction to regular followers of the notes, on account of her colour, a dull Tuscan red; and she bears the "trade mark" on the sides of the cab, as can be seen in the pictures.

Friend Carl included plenty of his own ideas in the engine, and everything has turned out O.K.; she steams and pulls and generally does the doings in the manner usually observed among good locomotives. Wheels with "fancy" centres being very popular in U.S.A. at the present time, the Hen is well up to date with steel discs, balancing of the drivers being obtained by drilling holes on the same side as the crank-pins. There are no knuckle-joints in the coupling-rods, the big-end bushing being extended and an articulated joint made on it. The valve-gear is Walschaerts as specified, but much altered in detail; the link brackets are on the inside, the radius-rod passes outside, and the reverse-shaft is placed well above the motion, lifting and lowering the radius-rod by means of an arm and drop-link at each side of the engine. Laird type guide bars and crossheads are used.

A Noticeable Departure

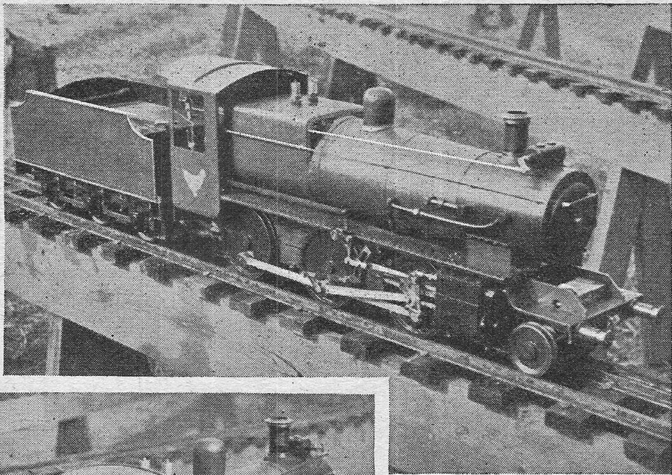
The boiler generally is to specification, the long narrow firebox steaming it wonderfully well on Welsh anthracite, which can be obtained in Providence, R.I., but here again the details differ. The most noticeable departure is the American type of front-end throttle. As Carl points out, it is very accessible, and doesn't look "out-of-the-way." The top feeds of the original engine are dispensed with, being replaced by side clacks, and a taller plain dome and higher safety-valves, set crosswise, are used instead of the squat fittings, which is quite permissible on the American load gauge. The cab is also higher, and the backhead fittings are to our worthy friend's own ideas. He likes a good big water gauge, which can be seen in the cab view; also prefers the double sliding firehole doors. I don't care much for this myself, as my experience has been that the slides become choked with coal dust, and makes the doors difficult to operate; also they take up more than their share of backhead space, as they need each side kept clear, to allow room for sliding. The boiler is fed by two eccentric-driven pumps and an injector, and there is also the usual emergency hand-pump in the tender. This delivers into the same feed-pipe as the eccentric pumps, eliminating one of the feed connections between engine and tender; the water goes through the valve-boxes of the eccentric pumps. A hand-operated valve is provided in the tender, to prevent the water from the hand pump blowing back into the tank. Feedwater is heated before entering the boiler by passing through a double loop of $\frac{5}{16}$-in. tubing in the smokebox. The "Little Red Hen" may not be much good at laying eggs, but she can certainly run and cackle all right! Her builder is now busy on an old-timer, a Delaware and Hudson 4-4-0 with Stephenson link motion and a Wootten firebox, to see if same will burn the American anthracite used on his domestic boiler; this should pan out all right, as old "Ayesha" did very well on the anthracite when she ran in U.S.A. in 1929-30.

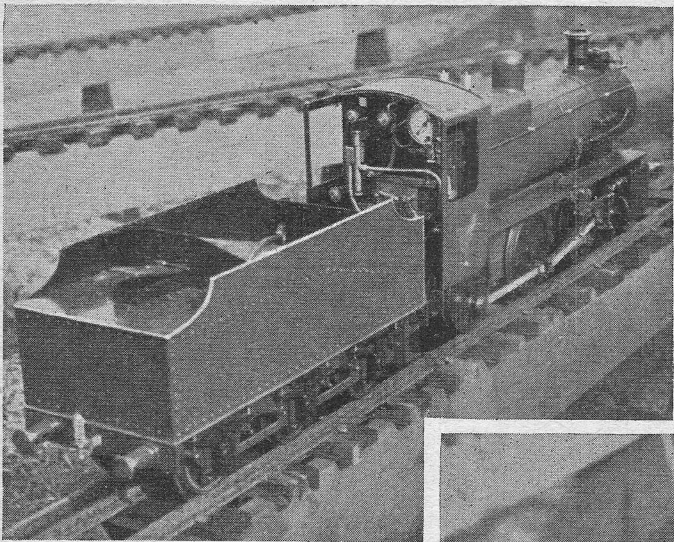
The Southern Pacifics

May I pass a vote of thanks to the good folk who responded to my recent request for a possible explanation of the advantages of the Southern Railway's "light" Pacifics over their contemporary 4-6-0s of the "1000" class on the Great Western. I received several interesting letters, very well-informed, describing the engines in detail and giving accounts of their performances to date; but apparently the point at issue has been completely overlooked. It is just this: granted that the Southern engines are, in a manner of speaking, "all they are cracked up to be," is there any material or other advantage in going to such an elaborate form of construction, when a far simpler job, with only two cylinders, one pair of wheels less, several tons lighter, and far better looking, can do the same work with equal facility at probably less maintenance and running costs? Exact comparisons cannot, of course, be made without trying the engines over the same road with identical loads and schedules; but nobody who is unprejudiced and has had any experience at all of the locomotives turned out from the Swindon "factory" during the Churchward-Collett-Hawksworth regimes can doubt for one solitary minute that the "1000" class engines will—literally!—deliver the goods.

"The simpler, the better" is a view not only held by most working enginemen, but also by the majority of the "higher-ups." It is a very significant fact that Mr. E. Thompson, who succeeded the late Sir H. N. Gresley as C.M.E. of the L.N.E.R., is making pretty drastic alterations to his former chief's locomotives; one of

them being to turn the three-cylinder 2-6-0 'jazzers" into plain two-cylinder engines, doing away with the complication of a third cylinder, with the conjugated valve-gear and all attendant accessories, at a sacrifice of a fraction of 1 per cent. of the rated tractive effort. Maybe it will turn out to be an actual *gain* in tractive effort, owing to the disappearance of one-third of the internal friction of "the

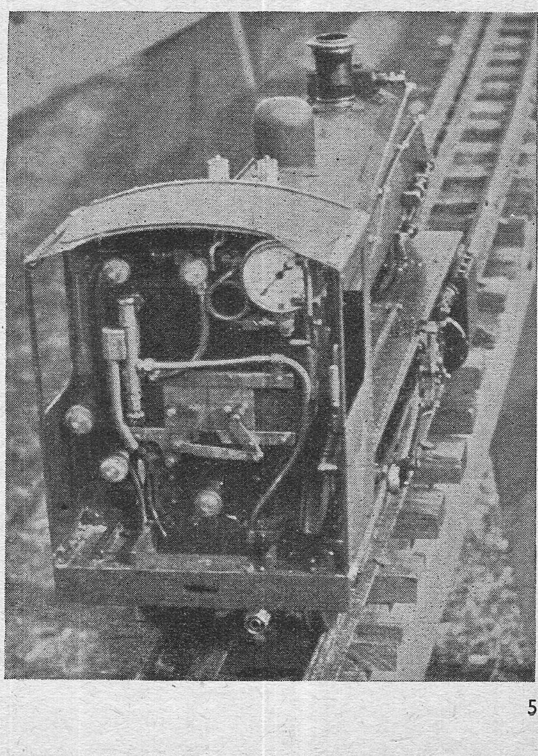




Above : Note "front-end throttle" and valve-gear

Left : " The Little Red Hen "

Below : Footplate " seen from the bridge "



works." Even the principal devotees of that most complicated box of tricks, the turbine condensing locomotive, freely admit that from the practical point of view, any locomotive should not only be economical in operation, and flexible in control, but should be as simple as possible. Eh—what's that ? No, " Bro. Facetious," I'm decidedly NOT proposing to describe a Curly version of the Ljungström, Zoelly or any other type of spinning-jenny monstrosity in these notes ; why, the K.B.P., who is an ardent Great Westernite, would fire me on the spot if I even suggested it ! I hope to introduce you to " Hielan' Lassie " next week, and sufficient for the day will be the evil—or otherwise—thereof !

Apart from simplicity, there are the questions of maintenance and durability. I am assured on the highest authority that the new Southern engines require very little in the way of maintenance, or " servicing," as it is fashionable to call it nowadays ; but then, any new

engine should need little attention during the early years of its life. A good example was our old D-class Stroudley tank No 4, "Mickleham," which came out in 1873 and ran something like 62,000 miles before needing any repairs. It will be later on, when anno Domini has had a say in the matter, that maintenance costs will show to advantage, or otherwise, over the simpler type of locomotive. The more working parts you have, naturally the more there is to wear. Granted freely, the enclosed middle "works" of the Southern engines are an improvement long overdue; on the "Brighton" in the old days, we always wondered why on earth some sort of a shield couldn't be devised to keep the ballast dust out of the motion. I well recollect the trouble we had when the Quarry line was opened at the turn of the century, and engines running over the unsettled new ballast, kicked up no end of dust, and suffered accordingly with "locomotive rheumatics." However, many enginemen hold the opinion that it would be better to eliminate the inside "works" altogether than cover them up! This is, of course, done on a two-cylinder engine with outside valve-gear, as in the rebuilt L.N.E.R. erstwhile "jazzer"; true, the G.W.R. two-cylinder 4-6-0s have link motion inside the frames, but the small amount of movement in the valve-gear parts is certainly not sufficient to raise a dust. At the same time, I don't know how modern drivers feel about it, but the old-timers would feel distinctly uneasy about the inside motion, including a chain-driven layshaft with six eccentrics and three complete sets of Walschaerts gear, being entirely boxed up and ungetatable; even on the tiny engine in my gasoline cart I wish there were some means whereby I could take a squirt at the big-ends, cranks and the rest of the blobs and gadgets—especially when I fancy there is a strange noise going on which shouldn't be there. It is curious how the old instinct persists!

Old "Dog Star" Does it!

I wonder what the life of the engines will be? Rumour has it that their contemporaries, the "queer ones," are already in bad shape and that many of them need heavy repairs, and replacement of the thin sheet-metal superstructures and tanks. If correct, it is a different tale to that of our old Kitsons and Jumbos; they were built to last, and they did, but they weren't the only ones, by long chalks. Not so very long ago, a friend travelled from Taunton to Paddington by Great Western. The train came into Taunton with fifteen coaches packed to capacity, and as there were large numbers of passengers waiting to go on to Paddington, two more coaches had to be put on to accommodate them; and what with the shunting, loading baggage, etc., the train was nearly 15 min. late leaving. She got going all right, accelerated up to a high speed, and held it to such good advantage that with only a couple of slight signal checks and the usual service slacks, she arrived at Paddington right on time, having made up the arrears. My friend said he expected to find a "King" class engine heading this little outfit, but was absolutely amazed to see old *Dog Star*, date 1907, standing quietly at the head of the "queue," as cool and unconcerned as if she had just come in from a trot around the back garden. If "21C101" and any of her sisters, at the age of 39, can put up a performance like that, then they will be worthy of the title of locomotive, and deserve hearty congratulations, though I shan't be here to offer mine; not in the flesh, anyway.

Several readers have suggested, half in jest and half in earnest, that I should scheme out a $3\frac{1}{2}$-in. gauge 4-6-2 embodying the dimensions and characteristics of the Southern Pacifics, but minus the "flannel jacket" and with a neat and symmetrical outline, so that she resembled Cinderella instead of the ugly sisters. I can't do too much at once, and "Hielan' Lassie" is going to "take all I've got" for the next few months; but if I *can* manage at some future time to fall in with the expressed wishes, I'll put the drawing in, with our worthy friend the K.B.P.'s approval.

Watch Your Step!

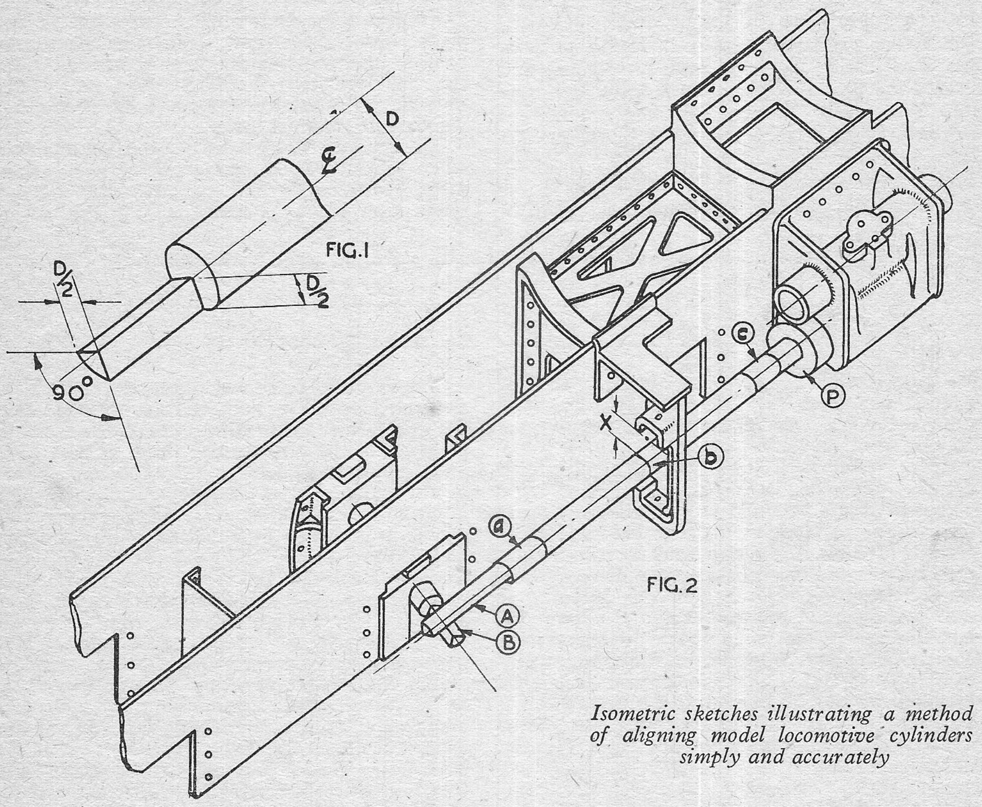
Readers usually air their grievances and complaints to me very freely in correspondence, knowing I have "been through it" myself, and two of the points raised recently are: what can be done when palpably excessive charges are made for a simple job, and what redress can be claimed for material supplied by a customer and spoiled or destroyed by somebody who has undertaken machining and finishing work? As an example of the first case, a reader who is building a large engine, found that his lathe was not powerful enough to turn the driving wheels, and approached a firm of jobbing engineers with the idea of getting the necessary turning done. They accepted the work, giving a verbal quotation of 8s. per wheel, and this was agreed to by the customer. Whilst the job was in hand, the firm offered to turn up the axles and machine the axleboxes, but gave no quotation. The customer, in view of the price quoted for the turning, accepted the offer, and in due course the goods were delivered; but not only was the whole job extremely shoddy, the wheels being badly chattermarked, the axles a hand-push fit in the wheel bosses, and the axleboxes nothing like specification, but the bill amounted to no less than £30 0s. 0d.! If anybody had served me a trick like that I should have returned the parts, cut my loss of the castings and material, and refused to pay, as I doubt if any firm, or individual, would have had such shoddy work and exorbitant charges exposed in a court of law.

In the second case, a boiler was sent to an unknown person to be brazed up. A reasonable price was quoted, and everything in the garden seemed lovely, until the boiler was returned, after payment had been asked for and sent off. The boiler was found to be useless; it not only leaked in half a dozen places, but the copper had been burnt, the brazing was of the "almond-rock" variety, and one of the tubes was split just inside the tubeplate. My correspondent wants to know if he can claim for the labour he put into building up the boiler and loss of material. I daresay he could, but it would cost more than the job was worth; even if successful,

(*Continued on page* 58)

ALIGNING MODEL LOCO. CYLINDERS

By D. BLACKBURN



Isometric sketches illustrating a method of aligning model locomotive cylinders simply and accurately

SOME years ago there was published in THE MODEL ENGINEER a photograph, together with a short article, dealing with the method used by the G.W.R. when aligning cylinders on the full-sized locomotive. The illustration showed a full-sized "King" locomotive at the point in erection where the outside cylinders were being fixed in alignment with driving axle centre. Instead of the taut piano wire stretched from a small hole contained in a centred plate (which is usually clamped in position at front end of cylinder) to a bar so fixed and wedged between horns that one edge represents the axle centre line, a beam of light is used, in conjunction with a collimating telescope. This is an accurate and quick way of doing this important job; so far as builders of small locomotives are concerned, I suppose it would be quite possible to imitate G.W. practice, given suitable, though no doubt, expensive apparatus; but the drawing and sketch given show my way of giving two centre lines a "corporate body" for a short length and then making them touch to give "intersection."

The method was used when setting the cylinders on a 1 in.-to-1 ft. model of a L.M.S. class "4" goods, having the 2-6-0 wheel arrangement. A friend who at the time was aligning cylinders on a ½-in. scale model of similar wheel arrangement, testified to the quickness and certainty of the idea. After fixing the driving axle-boxes in the running position, with suitable packing, as shown, and tightening the horn stay nuts to hold them firmly, a dummy axle, having one end prepared, as shown in Fig. 1, is made. The diameter D is made a light push fit through the axle-boxes, then for a short distance, say ¾ in., a depth equal to half D is filed or machined away, using the micrometer and working as accurately as possible; the axle is then turned through an angle of 90 deg., and a further half of D is removed, taking care with the mike and the square this time. When done, the apex of the

triangular section thus formed is the actual centre line of the axle.

The sketch, Fig. 2, shows this latter in position and the "cylinder centre line" passing over it. The gadget for the cylinder is a little more difficult on account of its length. It must be turned between centres in order to establish the straightness of the centre-line. I made the plug P, which is a push fit in each cylinder, from a short piece of bright mild steel bar; the actual extension piece is a length of $\frac{1}{4}$-in. gas barrel with the solid end A spigoted and brazed in, then the other end is screwed tightly into P. Whilst turning this between centres in the lathe, three short lengths a, b, and c, were turned all to the same micrometer size; these are useful as measuring "spots" when setting the cylinder to lie parallel with frame. The end of this bar A is, of course, filed in similar fashion to Fig. 1.

It must be borne in mind that the vertical position of the cylinder has still to be determined in the usual way—by making the centre-lines scribed on cylinder and frame actually coincide, preferably at the front of the engine.

When the two edges representing cylinder and axle centre-lines just touch, and the cylinder centre-line coincides with the centre-line scribed on the frame at the front, toolmakers' clamps are used to hold the cylinder on to the frame whilst the holes to take locating plugs are drilled through. I made these from $\frac{1}{8}$-in. silver-steel, fitting into reamed holes.

The cylinder bar can also be used as a reference when setting outside motion bracket, measurements between it and the slide-bar recesses being made equal, as shown at X in Fig. 2.

"L.B.S.C."

(*Continued from page 56*)

the culprit would probably prove a "man o' straw," unable to make a refund, so the only thing to do is to write off the item as "experience bought and paid for."

Many years ago I chronicled the exploits of a person I nicknamed the "dud workman," who accepted orders to build locomotives, delivered sheer rubbish after receiving payment in advance, and pursued his merry way until somebody took him to court and obtained an order for repayment by instalments. That stopped his gallop, but didn't compensate previous victims. I have also issued repeated warnings about buying a used engine under verbal guarantee, without actually examining it and seeing it in steam. All these warnings should be heeded at the present time, especially in view of the prevailing conditions, when so many unscrupulous persons are "on the make-haste."

A Little Advice

I'm no lawyer, and don't profess to know anything about legal niceties in cases such as the above; but I *can* offer a little advice which I hope is commonsense and sound. Before giving any fitting or machining work to anybody whose competence and integrity are unknown to you, insist on seeing some of his work; go and see him, or else get a reference from someone whom he has satisfied. Have all estimates in writing, and stipulate payment on delivery, if the work is satisfactory or has been carried out to specification. If the fitter, turner, coppersmith, or whatever he might be, is genuine, competent and honest, you'll find that he is only too willing to prove it in any way you wish. If, on the other hand, he starts hedging and making excuses, drop him like a hot brick; 'nuff sed! There are a few people about, such as ex-toolmakers and the like, who really can do the job at a quite reasonable price; but until you know who they are, it is best to be on the safe side, for there are, unfortunately, plenty of the other kind mentioned above simply out for all they can get.

The only really safe way to prevent being made a victim is to do the job yourself. If you follow the instructions for brazing a boiler, for example, as given in these notes, and make a mess of it, you don't face total loss; the experience gained is worth the price of the copper, and your next effort will be a great success. Experience teaches —even if it costs a little! Same with machining and fitting; maybe you get a cylinder in which the bore has come out taper, or bell-mouthed, or badly scored. Well, don't be downhearted, have another shot; the job will come right eventually and you'll have the satisfaction of knowing that it was all your own work, apart from the financial saving. You won't make any similar errors on the next locomotive! In my humble opinion, the only really valid excuse for putting out any work is lack of facilities for doing it yourself, as in the case of the reader first mentioned, whose lathe was not powerful enough to turn the driving wheels of a $9\frac{1}{2}$-in. gauge engine. That, however, was an exceptional case, most folk considering that locomotives one-sixth full size are rather too much of a good thing to build in a "hobby" workshop.

Fitting Parts Together

Anybody who has a desperate urge to put a locomotive together and has no facilities for turning, drilling, fitting, brazing or the various other necessary processes involved, could purchase finished components, such as cylinders, wheels, boiler, etc., and put them together with a few simple tools, like assembling a radio set, but not quite as simple! However, even here, a word of caution is necessary; parts should never be purchased from unknown sources, but from some place where they can be seen and examined before payment. This is a better plan than buying castings and materials and having somebody make them up; but the best plan of all is to concentrate first on getting a kit together, and then you can build locomotives to your heart's content.

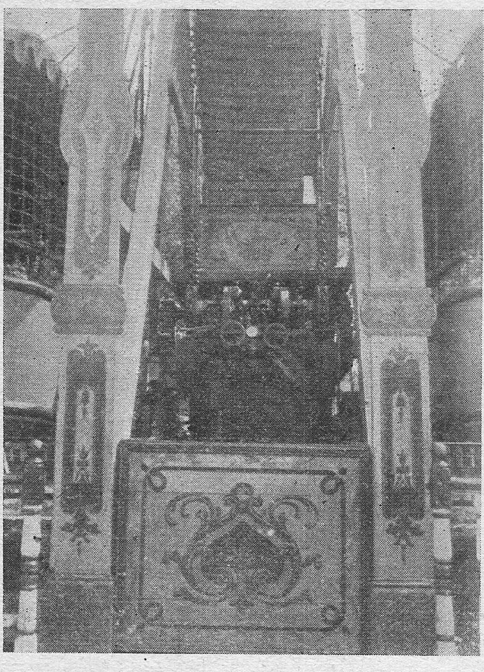
An Uncommon

Showman's Steam Plant

By GEO. GENTRY

DURING the recent war, and when stay-at-home holidays were the advice of the L.C.C., and other Municipal bodies, rather extensive fairs were organised on the open spaces of greater London, and, no doubt, of other provincial cities by those Municipal Authorities. Although the writer does not, and never has, patronised these entertainments in the orthodox manner for the traditional enjoyment of swings, roundabouts, etc., he never fails to visit such for the sole purpose of studying the type of mechanical and electrical apparatus and the modifications and improvements thereon that have come about since the days when the only out-and-out power-driven machine was the so-called steam circus, or straight steam roundabout. In these there were two interesting steam engines, the principal, a small size double H.P. cylinder overtype semi-portable, which was geared by spur and pinion bevel-gear directly to the circus pivot, and was mounted on its carriage. As with all portable-type engines, the self-contained boiler, of locomotive type, with front smokebox, was in evidence, but there was no chimney on its crown. The smoke-stack of the apparatus, which passed up the centre pivot of the circus, was in communication with an annular joint; that, in turn, was in tubular communication with the side of the smokebox, the crown of which was occupied by a veritable model vertical high-speed engine, which, by belt gear, drove the orchestrion or so-called steam organ. Both engines were the work of Savage, of Kings Lynn (at least so far as the writer's experience goes, for he has never seen the name of any other maker on these particular, and particularly fascinating, little engines). Of late years, these machines have been superseded by electrical motor drive generated by the well-known—to our readers—showman's traction engine, with dynamo mounted forward of the chimney. During the war, however,

General view of "Steam Yacht" show-piece

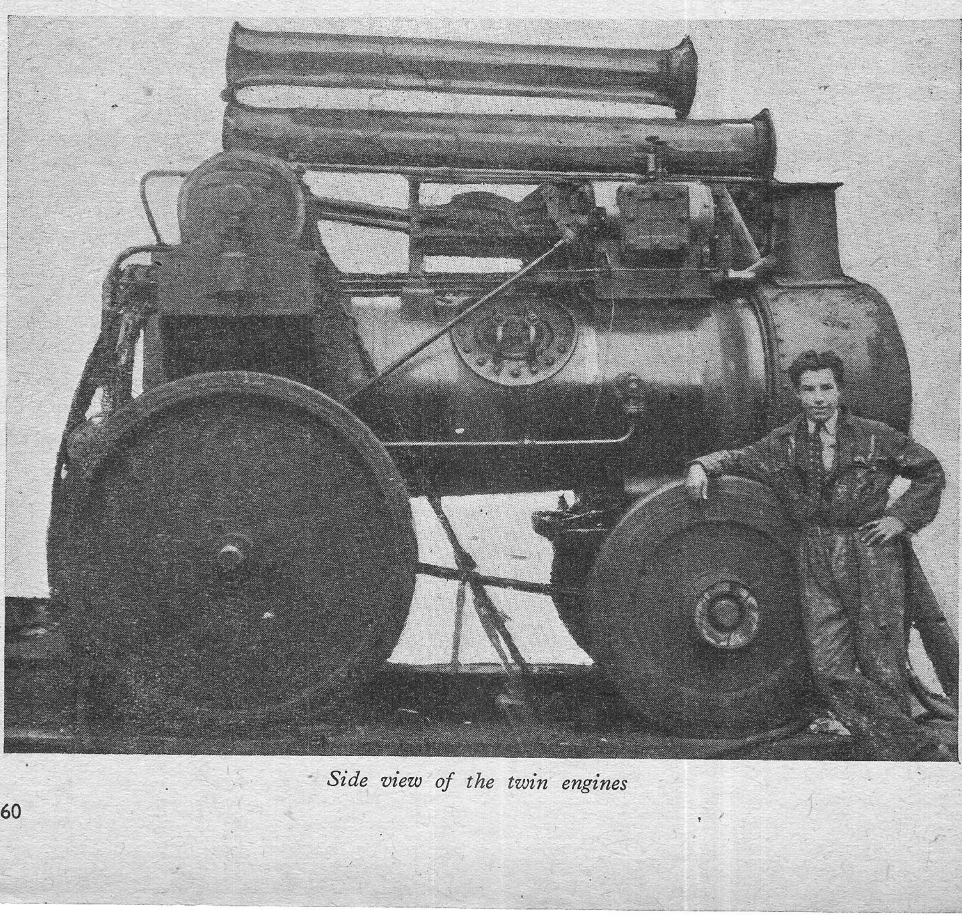


and on account of the short supply of coal, these steam-driven generators disappeared (were laid by, as one showman told the writer) and, in their place, the generating station took the form of a special motor-van, wherein was mounted either a direct-driven diesel-dynamo plant, or, as was evident in several cases, a dynamo only, which was ingeniously multi-belt driven from the carden shaft of the lorry, which, of course, was operated by the usual petrol-driven engine of the motor, the shaft presumably being declutched from its gearbox, just as the showman's steam tractor had to be declutched from the gear of the road wheels. In one very big fair

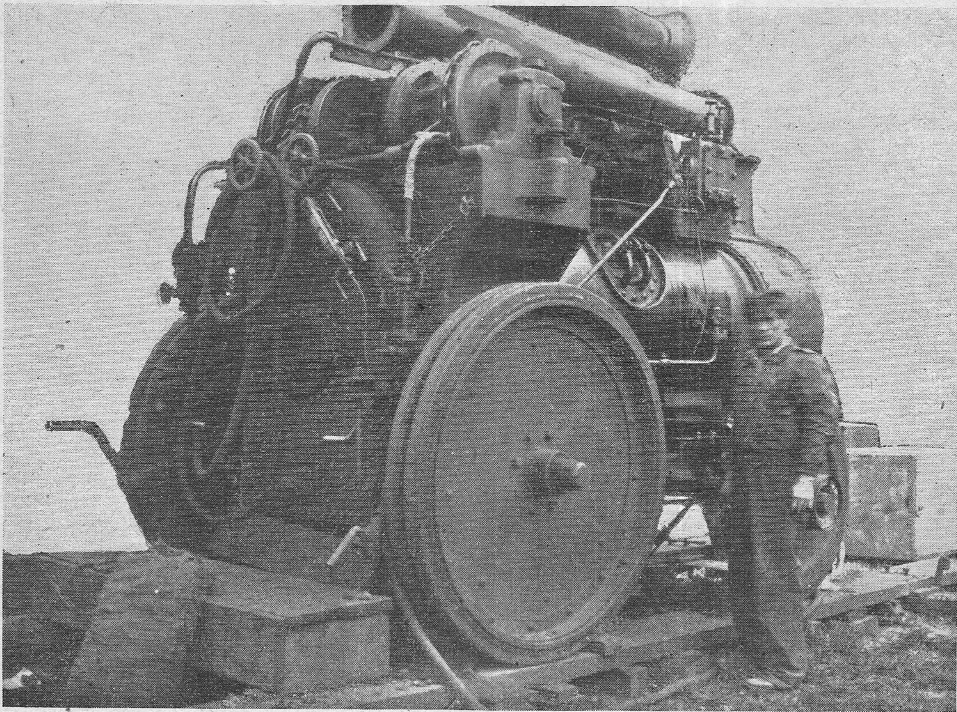
Left: The recess forming the engine room

provided for the stay-at-homes, the writer found that the only steam-operated attraction was something new to him in this connection, in the form of what is described as "Steam Yachts." In spite of the obvious misnomer, for nothing on earth could be less like a yacht hull than these gigantic swing boats, the writer was immediately attracted to the form and action of their driving power, as evidenced by a steam-driven engine, which, at first glance, seemed like a cross between traction and portable engines.

The first photograph is a general view of the



Side view of the twin engines


Three-quarter rear view of twin engines

front of the show, which consists of two very large swing-boats capable of seating 25 to 30 passengers each or more, and each mounted on double A-frames, which support the suspension shaft upon the bearings of which they swing. These two swings are placed in parallel with each other, having their suspension shafts on the outside; otherwise they are quite independent of each other, being spaced some 6 ft. or so apart by a central aisle, in the recesses of which is mounted the engine and in the fore part are the driving platform and coal bunker, the whole of which is duly hidden by the usual theatrical ornamentation. A close-up of this central chamber shows the rear view of the engine, a twin machine, driven from the common boiler, having its semi-rotary reciprocating elements over the centre of the firebox shell and vertically below the centre of suspension of the swings but each connected with its appropriate swing, but otherwise quite independent of its twin and independently driven.

The third and fourth are, respectively, side and three-quarter rear views of the engine, which bears the name of Robey, of Lincoln, as the maker; but an introduction of the writer to the owner—Mr. J. Mayne, of Hendon—furnished him with the information that the swings were the work of Messrs. Orton and Spooner, of Burton-on-Trent, but that the idea of the attraction as a whole came from Messrs. Savage. As a matter of fact, there are only two, or at most, three sets of these swings in existence, but the writer has since seen another pair, the engines of which bore the name of Savage. Now for some details of their working.

It is fairly obvious that to drive and maintain a large pendulum, as are, in fact, these swings, no high-speed power machine, as an internal combustion engine or an electric motor is suitable, and that a direct power reciprocating drive is necessary, relatively slow moving and with a fairly heavy push. That means a steam hammer action converted to semi-rotary movement. Again, a good cushioning action is necessary to control the swing of a pendulum, the bob of which can easily be loaded to carry a ton weight over and above its own weight. Fig. 1, a skeleton side view of the engine, shows it to be cylinder and motion mounted like a traction engine, with the rotary gear over the firebox; but here there is a difference, in that the latter gear is carried by large box-brackets instead of side-frames. Fig. 2 explains this more clearly. The twin cylinders, which although in one casting apparently, are quite independent in respect of steam supply, each having its own regulator. As seen in Fig. 2, each semi-rotary gear is on its appropriate box-bracket, which is particularly firmly attached to a shoulder of the firebox shell. It consists of a short shaft mounted on two heavy pedestals with a disc crank on the inside overhang of shaft close to a pedestal, allowing a stroke of about 16 in. Between the pedestals is mounted a chain pulley (distinct from a sprocket wheel, which is a toothed wheel to drive or be driven by a machine chain, or a chain sprocket, which is double

slotted and recessed in the outer slot to house the links, and so to either drive or be driven by a link chain ; how this drives will be explained later) having the usual double slots to take link chain on edge and flat. Between the cranks is mounted a "Ramsbottom" type spring safety valve, adjusted to blow at above 75 lb. per sq. in. (shown dotted) and the special regulator valves are set on the cylinder fronts below the slide-bars (not seen in Fig. 2, except by their handwheel controls, but seen in the photograph). This skeleton rear view, as described, explains most to be seen in the last photograph, in which view it should be noted how the pedestals, beside being bolted to their brackets, are also anchored by a stud joint set in a lug, cast on the outside of the bracket.

This brings us to the valve motion, which is designed first for hand control and after for automatic action. There are no eccentrics, but Fig. 1 should make clear how the controls work. The hand gear, which consists in a handled lever pivoted upon the outerside of the firebox shell (seen also on each side in the last photo. and Fig. 2) directly operates the slide-valve spindle, when right down the valve is full forward with the rear steam port uncovered. It does this through a short cross-shaft operating a short connecting-rod and a bell crank at its inner end. The latter controls a rocking-lever made double-ended and pivoted to rock on the middle of the top of the top slide-bar. This lever, which overhangs the sides of the slide-bars, is made with two sloping edges, which, in hanging below the middle of the crosshead, are contacted by a projecting end of the crosshead pin. Thus, when the regulator is opened, the piston moves forward, causing the boat to swing backwards, a little at first, but not enough to operate the rocker. When the load on the piston fails to lift the heavy boat further, the driver reverses the valve by hand, setting the rocker down the other way and giving the boat an impulse in the opposite direction. This goes on until the pendulum swing has increased sufficiently for the crosshead pin to fully operate the rocker, when the automatic action takes charge and the pendulum action increases to its full arc of about 80 deg. each side of the centre. The rocker is so designed to provide ample cushioning at each end, but if the boat velocity increases to such an extent as to cause a bump at each end, with a consequent heavy stress on the cylinder covers, the driver controls the steam supply through the regulator to bring the swinging mass to a reasonable action, which wants experience and care in the driving. The only noise in the action noted by the writer was a distinct knock due to play in the big-ends during the hand control, but so soon as the

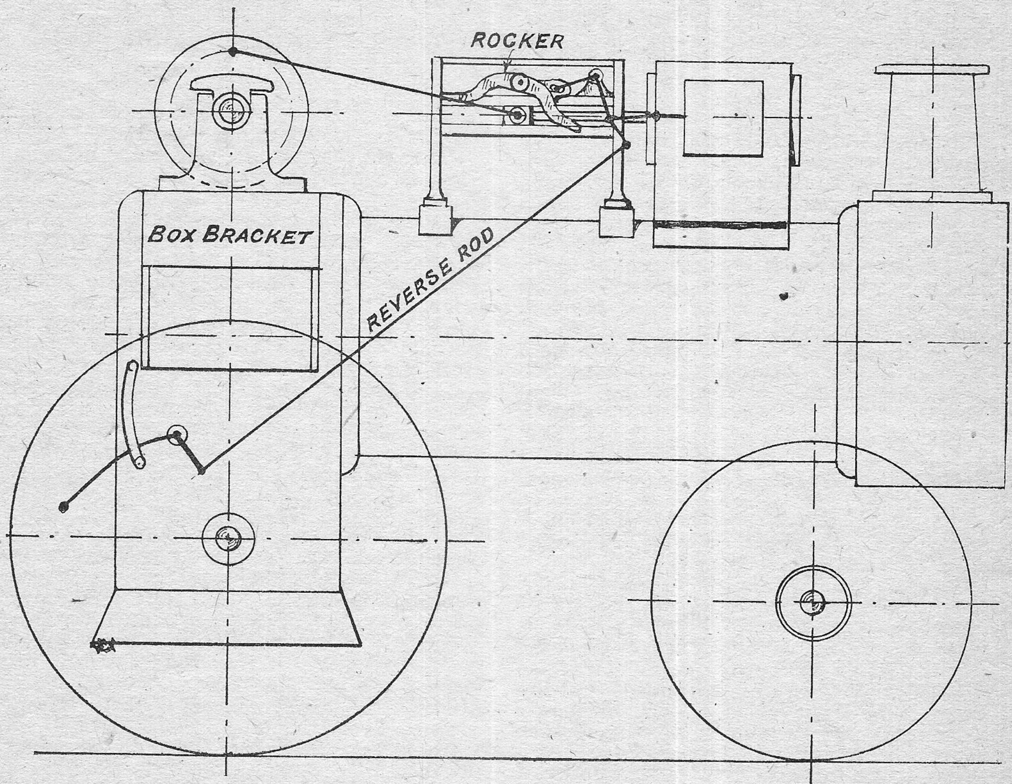


Fig. 1. Skeleton side elevation of reciprocating rotary engines. (Scale ½ in. to 1 ft.)

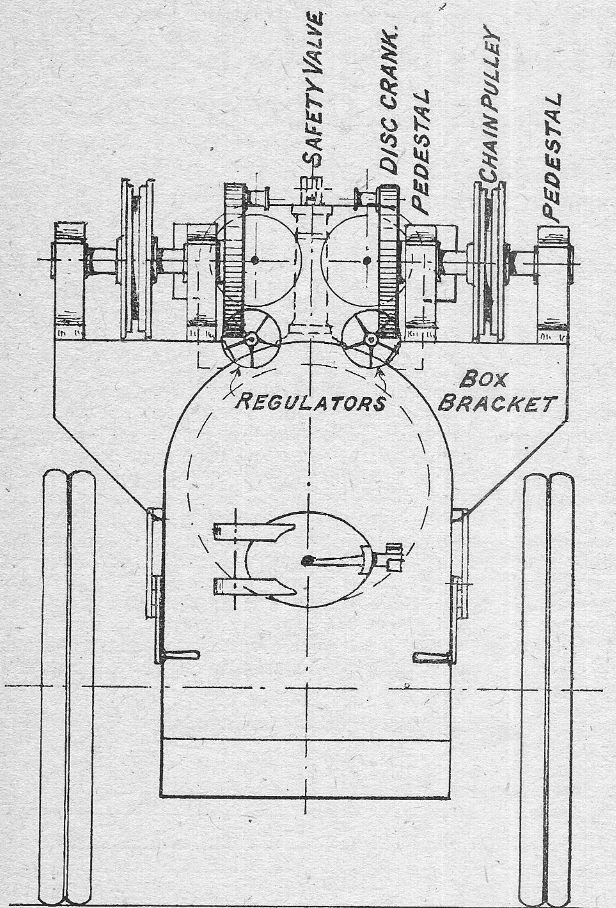


Fig. 2. Skeleton detail of rear elevation

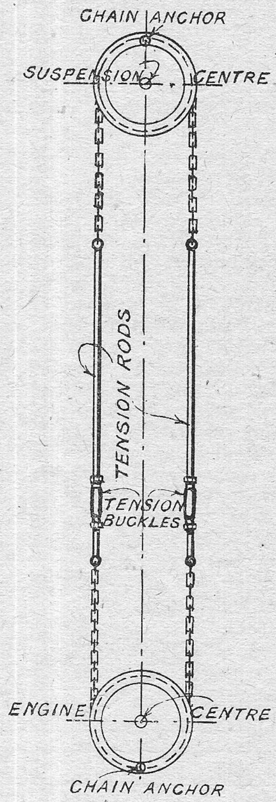


Fig. 3. Detail of direct tension chain drive

automatic control took charge, all knock was eliminated, so nicely is the cushioning provided by the shape of the rocker. By careful adjustment of the chain drive all back lash is eliminated. This is explained in the following :—

Fig. 3 shows the arrangement of the chain drive. When the boat is at rest hanging vertical the crank-pin is at the top, as seen in Fig. 1, and at half stroke. There is, as seen, a chain pulley also at the top keyed to the shaft, with which the boat rocks. When in static position, as described, the short chains top and bottom are keyed by a chain anchor to the pulleys. That at the bottom at the bottom of the pulley and opposite the crank pin. That at the top at the top of the pulley. Each side the chains are connected by a tension-bar furnished with a tension buckle with right and left-hand screws and lock nuts. To dissemble and unhook the chains these tension-bars have to be loosened, but when working they must be adjusted up to working tightness to avoid any back lash which would introduce uneven motion. Thus it will be seen that mechanically it is impossible for the rotary movement to exceed 90 deg. each side of the centre, but as 90 deg. would result in a vertical position of the boat which is unwise, the control by cushioning as described by the rocker prevents any overswing.

The writer leaves it to the reader to determine whether it would be possible to reproduce this action to model scale size ; the main point being that if the scale used be quarter full size, the period of swing becomes double. The writer noticed, however, that the period of swing is much reduced below the theoretical for a pendulum of the same length, due to excessive friction and long arc, so perhaps this same element in a model would prevent a small boat getting too merry !

A study of the photographs will explain how firmly the engine is anchored to its setting to prevent reciprocating rocking on its wheels noticeable in portable engines.

*A CONGREVE CLOCK

By Dr. J. BRADBURY WINTER

Details, dimensions and instructions for making an attractive timepiece

THE general arrangement drawings given in Figs. 6 and 7 are to be read in conjunction in the usual way; a few words of explanation will make them clear, but detail drawings will be given later of all essentials. Dimensions not marked on the drawings will often be found in the text.

The rocking-plate is seen to be on pivots, like lathe centres, screwed into upward projections from the two outside plates "A" and "D," passing through the 1-in. wooden base resting on the tops of the plates. The rocking-lever will be shown in detail later.

A connecting-rod joins the slotted end of the lever to a crank on the last arbor of the main train of wheels. The crank has a very small throw, only 1/20 in. To avoid congestion, the crankshaft is not shown in Fig. 6, but it is obvious in Fig. 7. Since the lower half of plate "A" is cut away in Fig. 6, the connecting-rod and other pieces can be shown in full lines.

The crankshaft bearing is a bushed hole in a bridge-plate supported on two pillars fixed to plate "A." The 20-toothed wheel on the shaft is not shown, but it is driven by the 95 wheel (upwards and to the left in Fig. 6), which is housed in the $\frac{1}{4}$-in. space between plate "B" and a triangular plate on three pillars. The arbor of the 95 wheel has a 20 wheel on it, driven by a 95 whose arbor is a little above and to the right of the crankshaft; Fig. 7 shows it to be in the middle compartment, not far from plate "B." The 20 wheel on this arbor is driven by a 95 about half way up the plate and a full inch to the right of the centre line in Fig. 6. On the arbor of this wheel, maintaining gear is mounted (Fig. 7) consisting of a clock spring in a

* *Continued from page 7, "M.E.," January 3, 1946.*

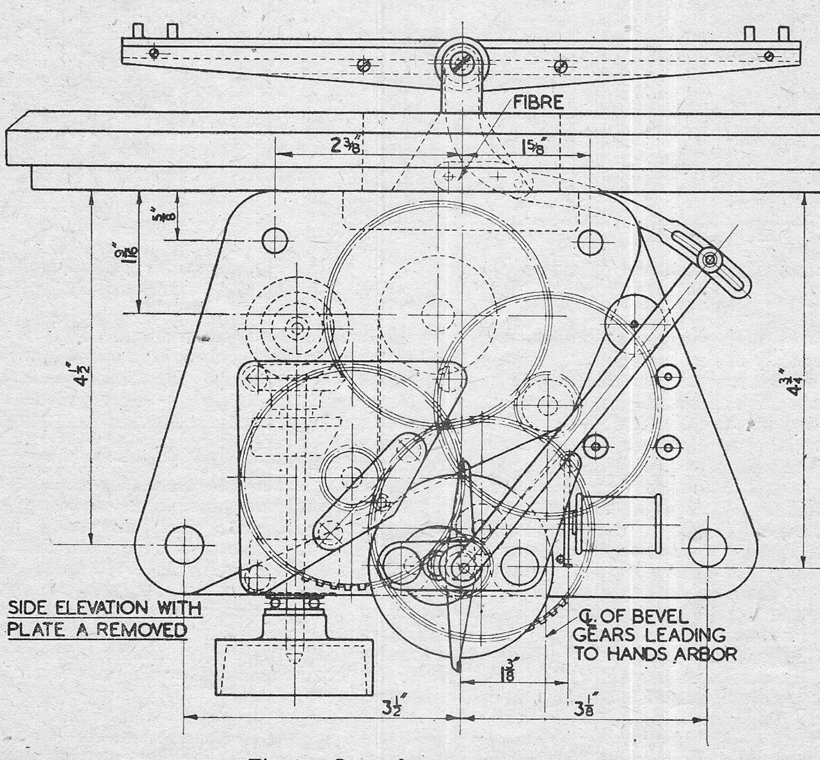


Fig. 6. General arrangement—side elevation

barrel, ratchet wheels, etc., and it also carries a bevel cog-wheel to transmit the rotation vertically downwards to another pair of bevel wheels which connect with the hand spindle. These bevel wheels are omitted in Fig. 6, though another bevel gear is shown on the left, which is part of the automatic winding mechanism and does not concern us now. Fig. 7 clearly shows the hand spindle gear.

The 20 wheel on the maintaining arbor, shown in both views, is driven by the 95 on the weight-line barrel in the left-hand compartment. The distance of this arbor from the top of the plates is important ($1\frac{9}{16}$). It is not possible to fix the exact position of the other arbors, except the crankshaft, which is on the centre-line in Fig. 6, and $4\frac{3}{4}$-in. from the top of the plate. The planting of the intermediate pivot holes will be dealt with later.

Coming back to the triangular plate housing the 95 wheel, there is a small bridge-plate on it supported on two pillars to house a ten or twelve leafed pinion with a fly, to slow down the turning of the crankshaft which has a wheel on it gearing with this pinion.

An eccentric on the crankshaft has a $\frac{1}{4}$-in. hole in it to take a small plug, whose weight will just balance the rocking-lever and connecting-rod. In the right lower corner of Fig. 6 there is a bobbin (actually two bobbins side by side). No fixing is shown because (as in our own cases) the bobbins may be taken from an old bell, and their original framework can be adapted to fix them to plate "B." The armature is fixed to a $\frac{1}{4}$-in. spindle above (see detail drawing to follow) and urged by a spring away from the bobbins against the pin at the bottom. A piece of watch spring is soldered on its edge to take the impact of the two-spoked lever on the crankshaft, seen in its midway, vertical position, which also has small pieces of watch spring soldered on its tips.

Above the bobbins there are three circles (Fig. 6) in the form of a right-angle triangle. These are brass washers with wires from bobbins, etc., threaded on insulated screws with nuts, serving as anchorages for the wires. Another attachment for wires is the fibre pad screwed to the rocking-lever. Above the three anchorages there is a larger circle; this is a short cylindrical object, the Westinghouse Spark-quencher, fixed on plate "B," like the anchorages, with a 6-B.A. central screw.

The four plates, "A," "B," "C," "D," can

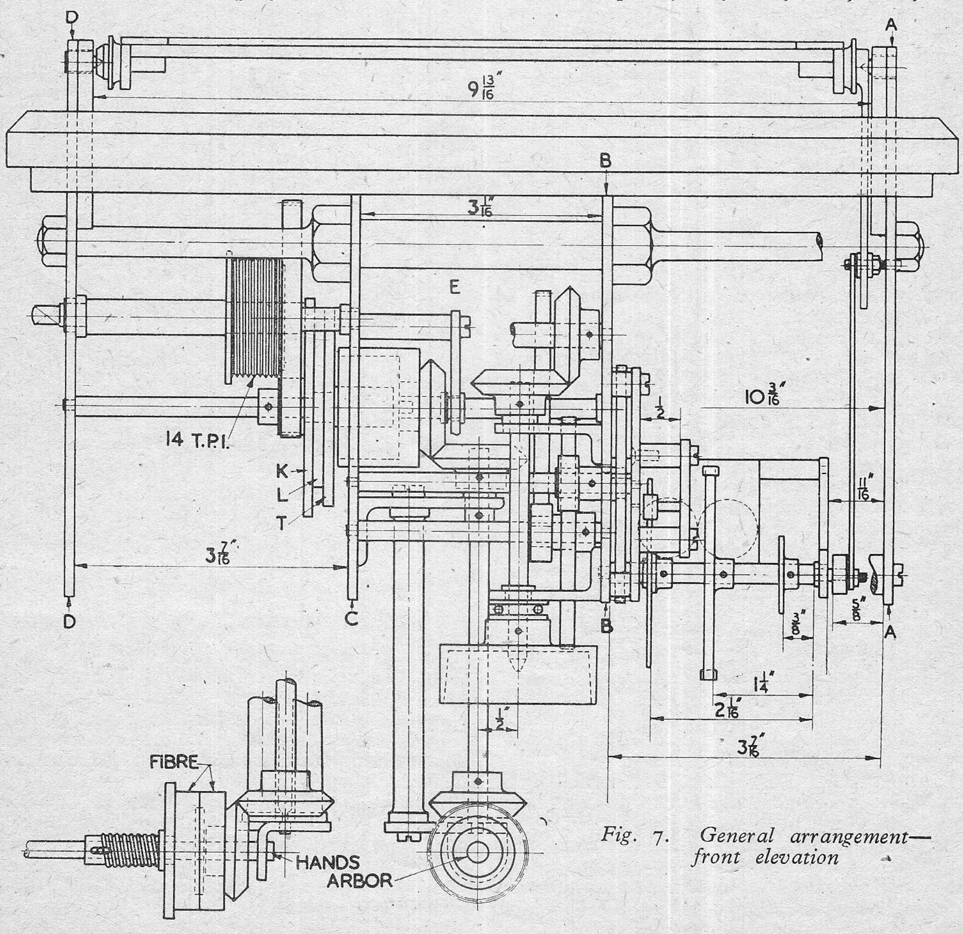


Fig. 7. General arrangement—front elevation

now be made from sheet brass $\frac{1}{8}$-in. thick. The two outside plates, "A" and "D," have upward projections to carry screws fitted with a central core of hardened silver-steel like lathe centres on which the rocking-plate is pivoted. The plummer-blocks seen in the photograph (October 18th issue) are purely ornamental, hollow shells or covers, to hide the true bearings, lever, wires, etc. Plates "A," "B" and "C" are all alike (Fig. 6), except for the upward projection on "A," and that the bottom edge of this plate will eventually have a notch cut in it as shown by the dot and dash line; but this notch is not to be cut at present. The other outside plate "D" is supported on only three pillars (see dotted line, Fig. 6).

Start with plate "B." File one edge straight, to be the top of the plate on which the wooden platform will rest. Scribe the central vertical line at right-angles to it. Centre-pop the four pillar holes, and with compasses set to $\frac{5}{8}$-in. mark the corners of the plate. Then set the compasses to 7/32 in. and mark circles; a half-inch drill cannot be trusted not to wander, and a little extra trouble now will save a lot later. Drill a half-inch hole in a piece of scrap steel, say $\frac{1}{4}$ in. thick. Put plate "B" on the piece of brass roughed out for plate "C," and lay the steel on "B" with the hole concentric with one of the scribed circles. Cramp all three together with two cramps, and put a third cramp of some kind, such as a small machine vice, at some distant part of the plates. Drill the hole through both plates, guided by the steel jig.

Chuck a scrap of $\frac{9}{16}$-in. or $\frac{5}{8}$-in. steel and turn about $\frac{5}{8}$ in. at one end to fit the hole in the plates; it may be slightly tapered with a file for about $\frac{1}{4}$ in. Make a second plug like it. Pass one through the two plates, cramp the jig on as before, and drill another hole. With these two holes plugged, drill the other two in the same manner.

Next, make a hollow plug to fit the half-inch holes as before, but bored $\frac{5}{16}$ in. to act as a jig for a $\frac{5}{16}$-in. drill; it is better to drill the hole in the plug a little too small and finish by boring. Part off at about $\frac{5}{16}$ in.

Cramp plates "A," "B" and "C" together, and drill one of the $\frac{5}{16}$-in. holes in "A" by means of the hollow jig. Now make two more plugs to fit the half-inch holes as before, but shouldered down for $\frac{1}{4}$ in. or so to fit the $\frac{5}{16}$-in. hole. Join the three plates together with one of these plugs; cramp them and drill another hole in "A" with the hollow jig. Fix this with the other two-size plug, and drill the remaining two holes, cramping the plates together always.

Drill the three $\frac{5}{16}$-in. holes in plate "D," The plates can then all be finished to size, using "B" as a template, plugged to the plate being filed, but not forgetting the upward projections on "A" and "D." The notch at the bottom of "A" must not be cut yet.

Before making the pillars, two useful tools should be made. Firstly, for those who have no dividing head plate, saw out a lever (Fig. 8) from $1\frac{1}{4}$-in. × $\frac{1}{4}$-in. mild-steel; get somebody to drill a $\frac{7}{8}$-in. hole at one end, or you can yourself file out a smaller hole to this size quite good enough. Make a flanged brass bush (the flange will keep it square with the surface) and sweat it in. The bush is to be the same bore and thickness as the hub of a change wheel, and will fit on one of the change wheel studs in the "banjo." The tooth will engage with a wheel on the mandrel, held in by a weight suspended from the lever.

With the aid of this dividing tool, the second tool is quickly made. All shafts that run between centres are liable to run dry of oil. For many years I have got over this by giving just one light tap with a three-cornered punch in the countersink, leaving grooves which retain the oil.

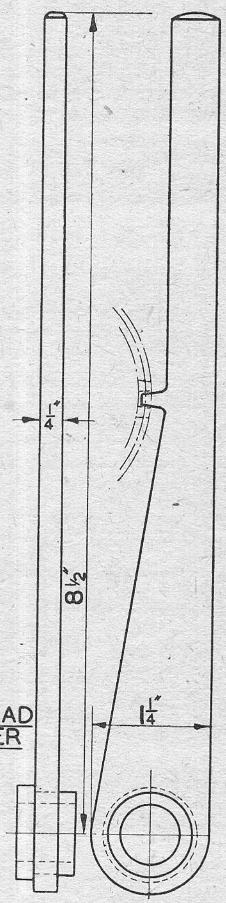


Fig. 8

DIVIDING HEAD LEVER

Chuck a piece of $\frac{1}{4}$-in. silver-steel, and file a point like a lathe centre. With the 60 wheel on the mandrel, put a chalk mark on each twentieth tooth, and with the dividing lever engaged, file three flats on the pointed part, meeting each other as in a broach. Harden and temper.

Now for the pillars. Chuck a half-inch Whitworth nut in the three-jaw, and bore it out to a good half-inch diameter for about 3/32 in., so that it may screw right home. Repeat for seven more nuts, eight in all. Drill a half-inch hole in a scrap of $\frac{1}{8}$-in. sheet brass to make

a rough sort of washer. Make a similar washer with a $\frac{5}{16}$-in. hole.

Cut off three pieces of $\frac{5}{8}$-in. brass rod, about $11\frac{3}{8}$ in. long, and one piece of $8\frac{1}{16}$ in. Drill a centre hole, say No. 50, at each end about $\frac{1}{4}$ in. deep, countersink, and give a tap with the three-cornered punch.

Turn one end for about $3\frac{3}{8}$ in., just to slip through one of the half-inch nuts. Then turn up to a shoulder 4 5/32 in. from the end, a good fit in the half-inch holes in the plates. Screw-cut 12 threads per inch to fit the nuts, using a die to finish with if you have one. Be careful not to injure the shoulder, if you should do so, you have a little length to spare and could afford to trim up the damage. The thread should not encroach on the last $\frac{1}{16}$ in. at the shoulder which is left untouched, to register with the hole in the plate.

Slip the brass washer on the pillar up to the shoulder, and tighten a nut against it. With a round-nose tool make the radius at the junction of the screwed and plain portions of the pillar. Remove nut and washer. Repeat for the other three pillars.

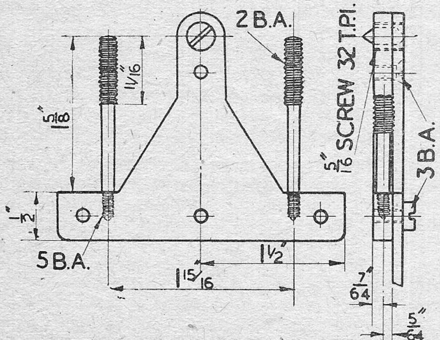


Fig. 9 THICKENING PIECES ON OUTSIDE PLATES

Now put the carrier on the other end, but not more than $\frac{3}{8}$ in. in from the end, to avoid bruising the finished portion. Repeat the procedure of the first end, but taking measurements from the shoulder, the distance between the shoulders to be exactly $3\frac{1}{16}$ in. Test with calipers to make all four pillars alike. Screw-cut to fit a half-inch nut as before.

Both ends of the long pillars and one end of the short one are now to be shouldered down to fit the $\frac{5}{16}$-in. holes in the plates, the new shoulders to be $3\frac{9}{16}$ in. from the old ones, the full measurement between the outside shoulders being precisely $10\frac{3}{16}$ in.; this corresponds in importance with that essential $9\frac{1}{8}$ in. overall measurement of the rocking-plate.

Alter the change wheels to cut 18 threads per inch, and screw-cut for $\frac{5}{16}$-in. Whitworth nuts. When doing the second end, the carrier may be fixed on a nut tightened up against the $\frac{5}{16}$-in. washer. The ends of all the pillars should be rounded off beyond the nuts; a fixed "steady" is helpful for this; a piece of wood in the slide-rest tool holder, with a hole drilled through it, is a satisfactory makeshift.

Assemble the complete framework, putting identification centre-pops on pillars and plates.

Looking at Figs. 6 and 7, you will see that the upward projections on plates "A" and "D" have thickening pieces screwed to their inner surfaces; Fig. 9 shows them in detail. The long studs for the plummer-blocks are screwed into their bases, $\frac{1}{4}$-in. mild-steel rod is turned down to be threaded 5-B.A. below, 2-B.A. above, all in one chucking, they must stand truly vertical. The edge of the tapped holes comes within 1/64 in. of one surface of the thickening piece. Fig. 9 shows that they are not central in it. When tapping them, pinch the piece firmly in the vice (with protecting clams, of course) to prevent bulging. Alternatively, the thickening pieces might be made from brass $\frac{1}{4}$ in. thick, faced off in the lathe to the dimensions given. after the holes were tapped. Don't drill deeper than about $\frac{1}{4}$ in.

For the rocking-plate pivots, start by making a tap; mild steel, case-hardened, will be quite satisfactory. Chuck a bit of $\frac{3}{8}$-in. rod, turn it down to $\frac{5}{16}$ in. for about $\frac{3}{4}$ in., and run a "gallery" round it for the screw-cutting tool to finish in. Set the change wheels for 32 threads per inch, and cut the thread. Turn off the threads for, say, $\frac{1}{8}$ in. at the snout, taking care not to take off more than just sufficient to obliterate the threads; this snout will tell you the size of drill required for the tapping hole. A short taper may lead from the snout to the full diameter of the threads.

With the aid of the dividing head, file four grooves to form cutting edges; these may slope off to nothing near the gallery, but must go well below the threads at the snout. Be careful to file the grooves for a *right*-hand tap, the cutting edges standing up facing towards you.

After hardening with Kasenit, or any other compound, drill a hole in a piece of scrap brass and tap it as a test. If all is well, screw the thickening pieces on the plates, drill and tap the holes. Now make the hollow steel shells to take the hardened centres. Screw-cut as when making the tap, but be careful when nearly to size; the screws are to be a fairly tight fit in the plates, so keep trying them in.

After finishing the thread, drill (No. 18) for the core to a depth of 7/32 in. (full diameter of drill) and continue the hole for another $\frac{1}{8}$ in. or so, with, say, No. 50. This will enable you to punch out the core from the back if required. Part off at 21/64 in. Saw a screw-driver slot at the back of the shell.

Chuck a bit of silver steel, file and polish it to be a comfortable push fit in the shell, and point it like a lathe centre. Harden it, tempering to light straw at the point. Push it right home in the shell, the pointed part only should project from the shell. If they screw into the plate tight enough to prevent them slacking out, all is well, but if a shade easy, remove the thickening piece and file a tiny amount off the upper inch of the surface that lies against the plate; the top fixing screw will then also serve as a locking device for the shell.

The thickening pieces must be marked to correspond with marks on the plates.

(*To be continued*)

*IGNITION EQUIPMENT

By EDGAR T. WESTBURY

A comprehensive review of the working principles, design and construction of electrical ignition apparatus employed on all types of internal combustion engines

Part II—Design and Construction (*Continued*)

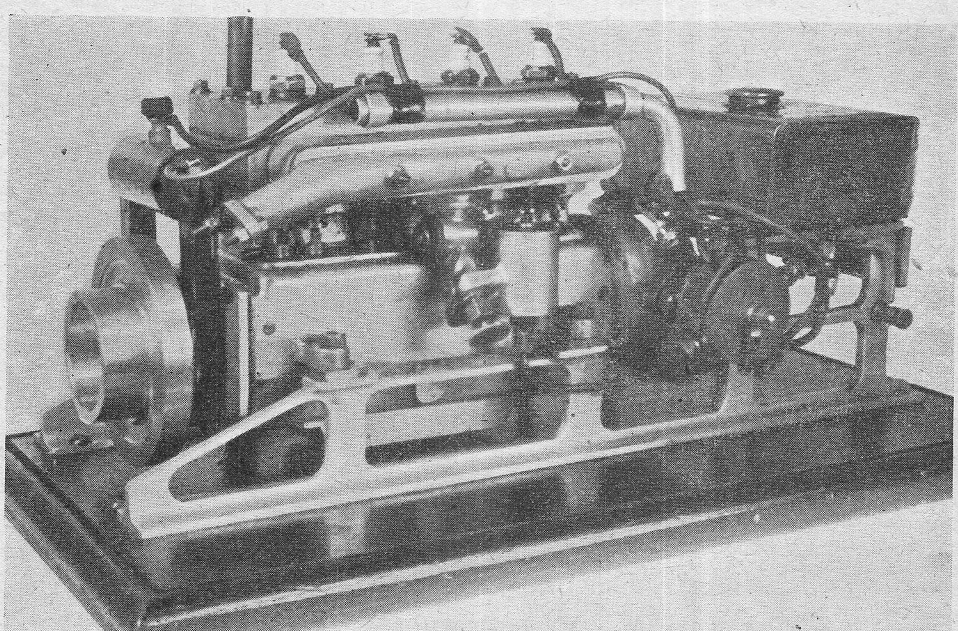
ALTHOUGH the two examples of the "Atomax" series of flywheel magnetos are the only ones so far completed, the experiments in this direction are still in progress, and are likely to lead to further successful magnetos working on similar principles. There is obviously a possibility of reducing the size and weight of these magnetos without impairing their efficiency or margin of "utility performance" to any serious extent. In one case, an attempt has been made to produce a four-pole magneto smaller and lighter than the "Atomag Minor," but this has not been successful up to the present, due to the lack of a really suitable magnet in the required size.

If, however, this particular series of magnetos are regarded—as definitely intended in their design—as true flywheel magnetos, in which the rotor replaces a plain flywheel, as used on the normal engine, it is rarely necessary to consider using a rotor less than 2 in. diameter and 7 or 8 ozs. in weight, for any engine intended for racing purposes in a model boat or car. This refers, of course, to the popular classes in use at the present time, and does not take into account possible future developments. There is not the slightest doubt that a magneto of the "Atomax" type can be developed having a rotor size and weight within these limits, and the weight of the rest of the machine is dependent more upon structural design than anything else.

The method of mounting the stator employed in "Atomax I" has certain advantages in reducing bulk and weight, and I am at present making experiments with two magnetos, both having the stator bracket or backplate made in the form of a casting, adapted to be clamped on the main bearing housing of the engine in this way. But even if the stator "bridge" employed in "Atomax II" is adopted, it is by no means essential to use the massive casting which, for purposes of convenience, has been employed in the experimental form of the machine.

An alternative form of construction, in which the same essential principles are retained with a

*Continued from page 22, "M.E." January 3, 1946.



Mr. Savage's 50-c.c. four-cylinder engine, now fitted with a special type of "coil replacement" magneto

substantial reduction in weight, is shown in Fig. 69. In this case, the solid casting is replaced by sheet-metal side frames, between which the two sets of stator laminations are riveted in their correct relative positions. To enable the assembly to be held down on the engine bearers, square blocks, with turned spigots at the ends to rivet into the side frames, may be used to take the fixing screws, or any other convenient means of mounting, appropriate to the general design of the engine installation, may be adopted. Needless to say, the side frames must be of non-ferrous material, and on the grounds of combined strength and lightness, sheet duralumin can be recommended if it is obtainable.

It is not, however, recommended that lightness of the frame structure should be carried to extremes, for while a sheet-metal structure may have a very high ultimate strength, its resistance to temporary or permanent distortion is not all that might be desired, and a very light frame might be liable to be put out of shape by a slight knock, or even the effects of vibration, sufficiently to foul the rotor. The difficulty of machining a very lightly constructed stator has also been referred to. In view of these considerations, I do not recommend making the frame plates less than 16 gauge, or, at the very thinnest, 18 gauge in thickness.

Why a Four-pole Magneto ?

I have already explained that by reducing the angle between opposing poles, the reversal of flux is speeded up and the iron circuit is shortened, both of which constitute important practical advantages. But some of my correspondents have pointed out that in a magneto required to produce one spark per revolution, only two of the poles are functionally active, and it seems superfluous to have the other two there at all. There are, however, quite sound reasons why I decided to use four poles in the magnet for this series of magnetos. In the first place, a four-pole magneto of either of the types illustrated is symmetrical and, even though it may not be in perfect dynamic balance as originally cast or fabricated, is much easier to balance than any form of magnet with asymmetrical poles. It is also easier to magnetise a magnet with the poles equally spaced. But a still more important practical reason for using a four-pole magneto is that it enables the design to be used either for single-cylinder or multi-cylinder engines, with no alteration in the design beyond the addition of a high-tension distributor and a multi-break contact breaker cam. These items do not necessarily have to be incorporated in the magneto itself.

In a variation of the "Atomax" design, I have made use of a rotor assembly resembling in some respects the type which I have described as "assembly A," but having three equally-spaced pole-pieces are, of course, designed, both in embracing an angle of 60 degrees. The stator pole-pieces are, of course, designed, both in respect of angular location and length of face, to suit the rotor arrangement. This form of magneto is quite practicable, and will give quite good results on single-cylinder engines; but it neither simplifies construction nor produces any special advantages over the four-pole type, so I have not considered that there is any urgent incentive for developing a magneto on these lines. The adaptability of the "Atomax" design, in one or other of its forms, to so many types of engines, both single and multi-cylinder, is an advantage which will appeal to many readers.

Flywheel Magneto Fallacies

Some of my correspondents are evidently under some misapprehension regarding the scope and application of flywheel magnetos. There appears to be an idea that a magneto with its rotor mounted directly on the engine shaft is suitable for use only on a two-stroke engine. In one case, it is proposed to mount the flywheel magneto on the camshaft of a four-stroke engine, and my advice is asked as to whether the speed reduction will seriously affect magneto efficiency.

My reply to this is that there is no need whatever to resort to this expedient; on the other hand, the fitting of any type of flywheel to the camshaft would be most undesirable on mechanical grounds. In the first place, its effectiveness in producing momentum, for a given size and weight, would be halved; but a much worse effect would be the gear chatter caused by the reversal of effort on the power and idling strokes. This assumes, of course, that no other flywheel is fitted to the main shaft; but where such a flywheel is already fitted, the reason for using a flywheel magneto is much less urgent.

No doubt many who propose to use a magneto in this way are very concerned about the effect of firing an extra "unwanted" spark at the end of the exhaust stroke, as occurs when any ordinary single-cylinder magneto is run at engine speed on a four-stroke engine. I may as well reassure them at once on this point; the only possible disadvantage is that there is a *very* remote risk of firing the incoming charge if the inlet valve opens abnormally early. It is almost impossible for this to occur on an engine which is timed according to conventional practice, though "freak" timing for racing engines, involving a considerable overlap in the inlet and exhaust valve opening periods, makes it theoretically possible. On full-sized engines, the running of the magneto at engine shaft speed has often been practised, especially where the magneto is combined with a lighting generator which must necessarily run at a high speed; and no undesirable traits have resulted, so far as I am aware.

If, however, one wishes to eliminate the alternate idle spark when using a flywheel magneto on a four-stroke, this can be done quite easily by mounting the *contact-breaker* on the camshaft. This is a method which is rarely, if ever, employed in full-size practice, as it would be generally undesirable to make the magneto in two separate units, both requiring careful fitting up and timing on the engine; but there is no objection whatever to it on a model engine, and it works in quite well with the magnetos which have been described in these articles.

Wasted Energy—Electrical or Mental ?

Another point which worries some of my correspondents is what happens to the surges of e.m.f. in the secondary when they are not utilised to produce a spark, by breaking the primary

circuit at the contact-breaker. The ordinary two-pole single-cylinder magneto has two reversals of flux per revolution, but only one "break" at the points ; thus one half-wave is idle and unproductive. A four-pole magneto under similar circumstances would produce three idle half-waves and one which is usefully employed, but if used with a half-speed geared contact-breaker as suggested, the ratio would be seven to one. This appears to be a very wasteful way of using electricity, but its disadvantages are more apparent than real, and, if not absolutely inevitable, are, at any rate, the lesser of two evils.

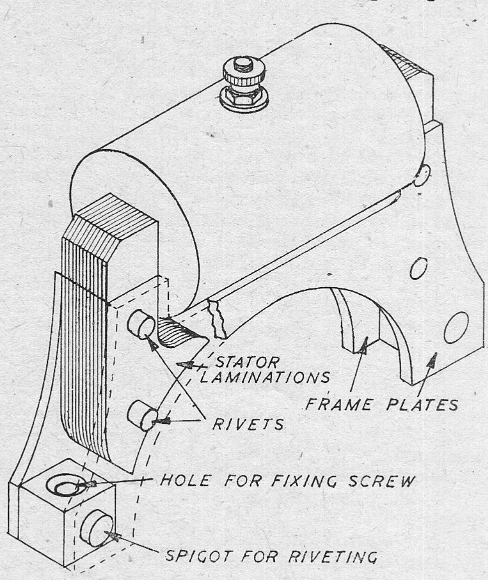


Fig. 69. A suggested modification to the structure of the "Atomax II" magneto, using sheet-metal frame plates

Students of electrical theory often get unduly perturbed about these redundant current surges, apparently fearing that they may cause damage to the secondary or produce sparks at the wrong time. In one job on which I was engaged a few years ago, it was proposed to use a magneto direct-coupled to the main shaft of a four-stroke engine, and the electrical staff promptly went into a huddle to consider the necessity of providing a high-tension distributor to earth the unwanted volts ! Considering that the secondary voltage on the idle surges never reaches more than a few hundred volts, their concern was rather misplaced.

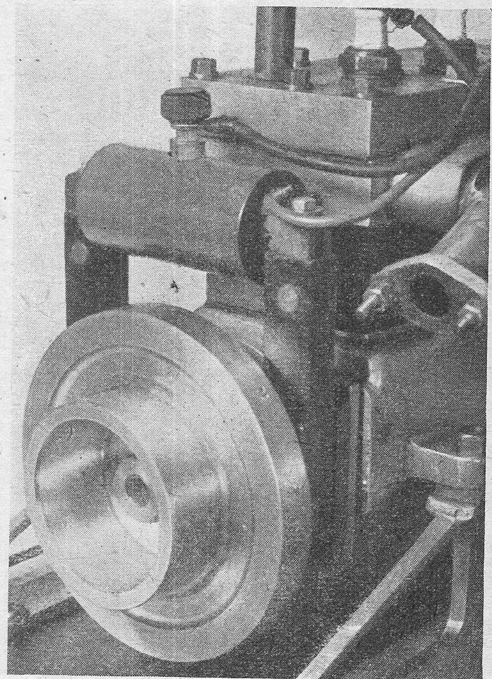
I may say that, in my experiments with small magnetos, the last thing I have ever had to worry about was what to do with unwanted electrical energy ; and even the question of the mechanical power wasted in these idle surges is not so momentous as it may appear in theory, as proved by the very small amount of power absorbed in working these magnetos.

Magnetos for "Multis"

I have already mentioned the possibility of using the "Atomax" and other forms of magnetos on engines having two or more cylinders. Interest in the modelling of multi-cylinder engines is growing rapidly, and it may therefore be in order to illustrate an example of a very successful experiment in the application of a miniature magneto to a four-cylinder engine.

The engine in question is one of 50 c.c., which was built some years ago by my friend Mr. W. Savage, to whose co-operation I am indebted for the opportunity to make the experiment. It was at first intended to fit the engine with a magneto of the "Atomax II" type, but some modification was considered desirable to avoid the necessity of altering the very neat cast engine bearers which were fitted to the engine. At this time I managed to obtain a two-pole disc magnet of $2\frac{1}{8}$ in. diameter by $\frac{1}{2}$ in. face width (original purpose unknown), which appeared suitable for use in a magneto of this type. It was decided to use this magnet, attached to the back of a bronze flywheel, in conjunction with a stator similar in essential respects to that used in the "Atomag" series of magnetos.

One practical difficulty which arose in applying this magneto to the particular engine was due to the fact that the projection of the crankshaft from the main endplate was rather inadequate in length to accommodate the required flywheel, with allowance of sufficient room behind it for the magnet and the stator, with its coil, which had to be carried clear of the cylinder-block. The arrangement seen in the photographs was



A close-up of the magneto on Mr. Savage's engine

(Continued on page 72)

Model Racing Car Notes

By F. G. BUCK

As made evident by recent articles in The Model Engineer on this subject, interest in model racing cars grows apace, a fact which causes intense satisfaction to those already absorbed in this comparatively new aspect of model engineering. I should, therefore, like to give an account of the latest activities in this particular branch of our hobby in Stoke-on-Trent.

Unfortunately, the number of persons engaged in model car building in this district is lamentably few; three, to be precise, Mr. Hopkinson, Mr. Capper, and myself.

Mr. Hopkinson's car's best speed to date has been 58 m.p.h., but this car has been suffering from fuel feed troubles, due to that sometimes helpful, sometimes exasperating phenomenon, centrifugal force, a trouble in which he has recently been joined by the writer. I have schemed out a fuel tank which *may* overcome this trouble, but Mr. Curwen informs me that his experiments in this field have met with success, and that, all being well, he will be describing his car's latest fuel tank in the pages of The Model Engineer.

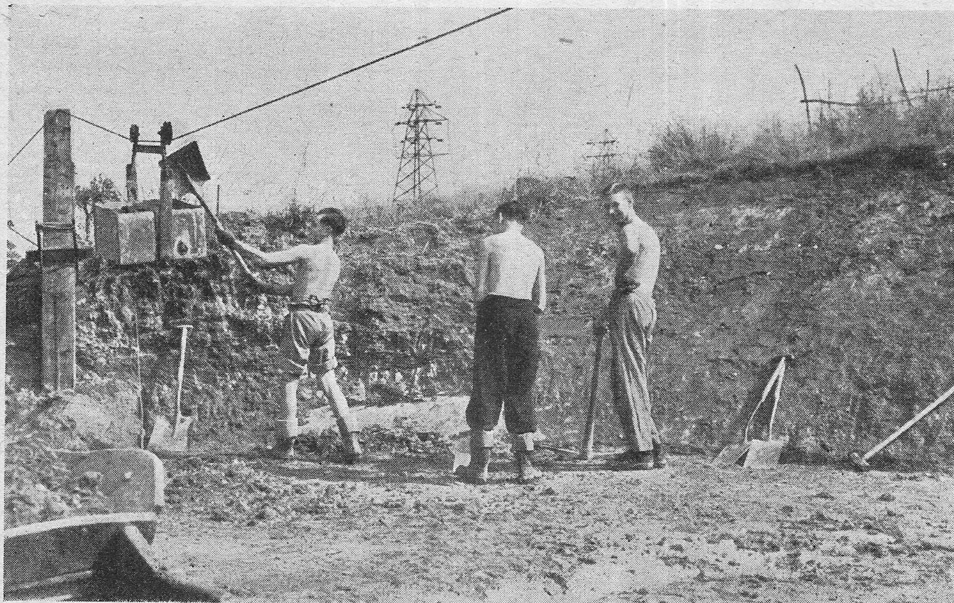
Car construction on my part, has been virtually at a standstill during the year, much energy (and how) being devoted to the levelling of a piece of ground most generously loaned to me by my father, for the purpose of constructing a special track solely for the racing of model cars.

I should like to make it very clear that this venture could never have been successful had it not been for the extremely generous, whole-hearted co-operation and assistance given by my friends, several of whom are members of the Crewe Society of Model Engineers, and who have given freely of their time and money in railway fares, etc., having to travel a total of some 40 miles to and from the site, and very often arriving back at their homes well after midnight. To them, *and their wives*, I am indebted, not only for their work on the track, but for an object-lesson on the spirit of comradeship and generosity that invariably appears to prevail amongst those genuinely interested in model engineering.

All that, however, is another story, that I hope to be allowed to relate in The Model Engineer when the track is completely finished. Meanwhile I am sending a photograph to show progress to date.

We have recently obtained permission from the Stoke-on-Trent Education Authorities to use a school hall occasionally for the running of our cars.

Although the length of line it is possible to use in the school hall is very short (14 ft.), the floor is good, and my own car's best speed to date on this track has been to attain an average of 67 m.p.h. for the quarter-mile, during which several laps must have been completed at around 70 m.p.h., as speed towards the end of the run



Willing helpers on the construction of the model car racing track

was somewhat slower than at the commencement, mainly due to one of the driving wheels shearing its driving pins.

The word "attained" is used because the car actually *did* achieve this speed and there is, in some quarters, not connected with THE MODEL ENGINEER, a strong tendency to quote a speed which a car is *considered* "capable of," a practice which I think is somewhat misleading, to say the least; it is probably due to a spot of wishful thinking, as any car is *potentially* capable of whatever speeds one's imagination or conscience will allow.

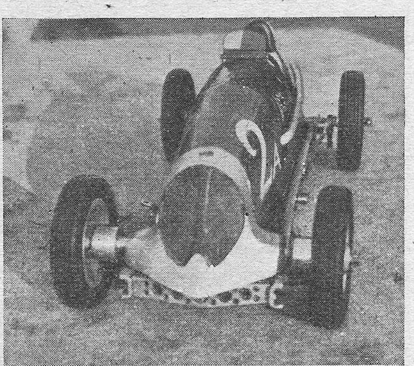
I should be interested to know if 67 m.p.h. is the highest speed so far attained, *in this country*, by a model racing car, and, if so, are there any objections to my claiming a record for this distance? The run was electrically timed by the apparatus which was described in THE MODEL ENGINEER, No. 2287, and there were many witnesses, including officers of the R.A.F. and members of the A.T.C., who viewed the proceedings with considerable interest.

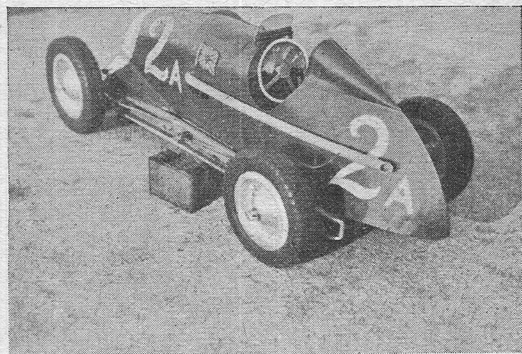
Having Mr. Boddy's recent car article in mind, I think the motor's exhaust note during this run would have met with his disapproval, but, in view of the car's performance, I intend to put up with that! I enclose a photograph or two of the car, taken by my father, and I hope it will pass Mr. Boddy's "appearance" standard. Although it is a free-lance design, I hope readers will agree that it is hardly a "mechanised truck."

I should also like to tender my personal view, which I believe will be shared by most practical racing car *builders*, that the suggestion of an hour's endurance run ("to vary the monotony"—strewth!) is ridiculous, unless a special class of cars is evolved somewhat after the style of the power-boat "steering" class.

"We three" in Stoke would be very pleased indeed to make welcome anyone in the district, or out of it, who is considering building a model racing car, and assure them of our greatest possible assistance towards this end. The formation of a Model Car Club in the district is very much desired, but three persons hardly constitute a club.

"Now, the Potters"—what about it?





Left: Streamlining necessary now? Right: By the side of the car is the midget 4-volt accumulator used in place of dry batteries for ignition purposes

Ignition Equipment—*(Continued from page 70)*

eventually arrived at, after very careful consideration, and a good deal of trial and error with dummy flywheels and other "mock-up" fittings. The result is quite satisfactory for all practical purposes, except that there is a case for a heavier flywheel—the one used was the largest which could be made from the available material—and the stator limbs have therefore been made long enough to allow of fitting a flywheel of larger diameter at some future opportunity. So far as ignition is concerned, there is no cause for complaint.

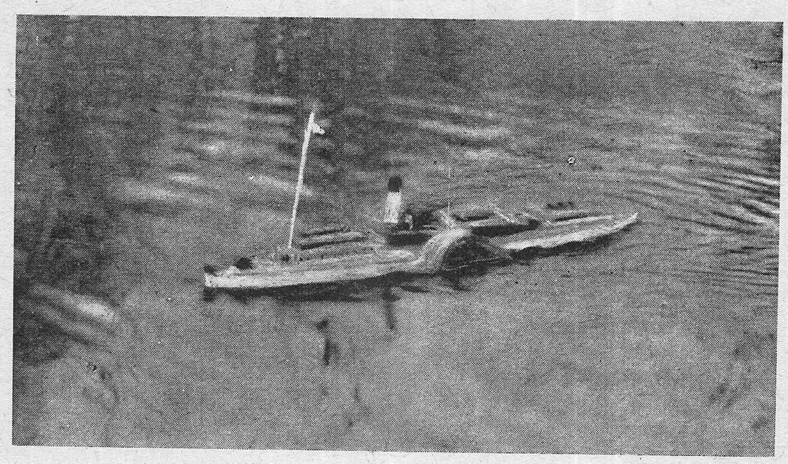
It will be seen that this magneto can also be regarded as a "conversion" unit, as it is designed to replace the original coil ignition system. For this reason, the contact-breaker and high-tension distributor, which were fitted to a skew-geared cross shaft, were retained, and both the primary and secondary leads from the magneto coil were connected to the appropriate terminals of this unit. The original condenser has also been utilised for the magneto system.

While this installation certainly does not conform to prototype design, it will be apparent that it is easily the simplest way of equipping a four-cylinder engine of small size with a magneto and involves the minimum addition of bulk and weight. The very smallest practicable "unit" magneto of conventional type would have been out of true scale proportion to the engine, and whether geared or direct driven, would have occupied more space than was desirable; this magneto, which has an ample margin of working efficiency, may possibly be considered an incongruity, but is certainly not an excrescence.

In its original form, the engine was equipped with a full-sized car ignition coil, and was an exceptionally easy starter under all conditions. It still is!

(To be continued)

"MARGARET" By W. R. HALLETT



THROUGH the very interesting articles by Mr. F. C. Hambleton, and because of memories of happy times spent on the *Eagle* family of Thames boats, I decided to build a miniature paddle steamer. It was to be of the simplest design, completely free-lance, few frills, and, I hoped (vainly, as it proved), capable of being built quickly with construction limited to materials easily available. One very rough plan was drawn, and immediately scrapped, as I had in mind exactly what was required, and preferred to work without drawings.

The first job was the construction of the hull, and an approximate estimate of the size required to float a full boiler, small oscillating-cylinder engine and gearing, methylated-spirit tank and burner, one or two deck fittings and so forth, resulted in the choice of a sheet of metal. Metal was preferred, as I dislike working in wood of any kind.

Search was made for a sheet of thin brass of the size needed, but after spending several lunch-hours vainly trying to get this material, tinned iron was substituted. The latter was of wafer thickness, and, if shaken, immediately produced a crease!

Not having worked in sheet metal to any great extent previously, it was necessary to resort to experiments with pieces of paper the same size as the metal sheet intended to be used, until the correct manner of cutting was found. Having decided to try to make the hull out of one piece of tin, it took some time to evolve cuts which would achieve this and still look presentable, the most awkward feature being to fashion the stern; but eventually this was accomplished. The cuts are shown approximately in Fig. 1.

Now came the second snag, which was to bend the hull without creasing it, and set it up for the next job, i.e. soldering. This proved to be extremely awkward, but I started at the stern, the upper part of which was grasped firmly between finger and thumb, and pressed slowly into approximate shape. (Warning is hereby given to anyone who uses this method of construction, at any rate with thin tin-plated iron, that the points marked *a* and *b* on Fig. 1 want very careful watching, because, if in the exertion of the stern-bending process, the hull swings clear of bench or table, the whole of the unsupported front part of the hull droops forlornly and forms a very bad right-angle crease. If the process is repeated several times, the result is two pieces of metal instead of one!)

After roughly shaping in this fashion, a small piece of brass was temporarily soldered to the two "wings" to hold them together, and a permanent metal clip was soldered to the heel of the hull. Next, a clip was bent up, measuring the full depth of the prow, and was slipped on to the hull whilst the bottom of the prow was gripped by pliers. Before being placed in this position, the clip had been thoroughly tinned, and after it was in position, solder was run down the inside and outside with a "Spitfire" blowlamp, making a very rigid job.

Attention was again transferred to the stern, and a strip of metal cut and lightly bent to take up the shape of the hull from the top of the heel to the edge of the deck. Finally, the V-shaped cut sides of the hull were drawn into position, clamped, and a piece of metal was soldered to them on the inside of the hull.

Although not a professional job, the hull looked quite good; and, apparently following the urge of a good many modellers, I was imbued with a desire to see what the boat would look like when a bit further advanced, i.e. with paddle-boxes and funnel fitted. These were cut out of cardboard and temporarily fixed, and though this took up a bit of time, it wasn't wasted, because the job was beginning to look fairly decent.

The hull was now put on one side, and attention given to positioning machinery. I wanted to

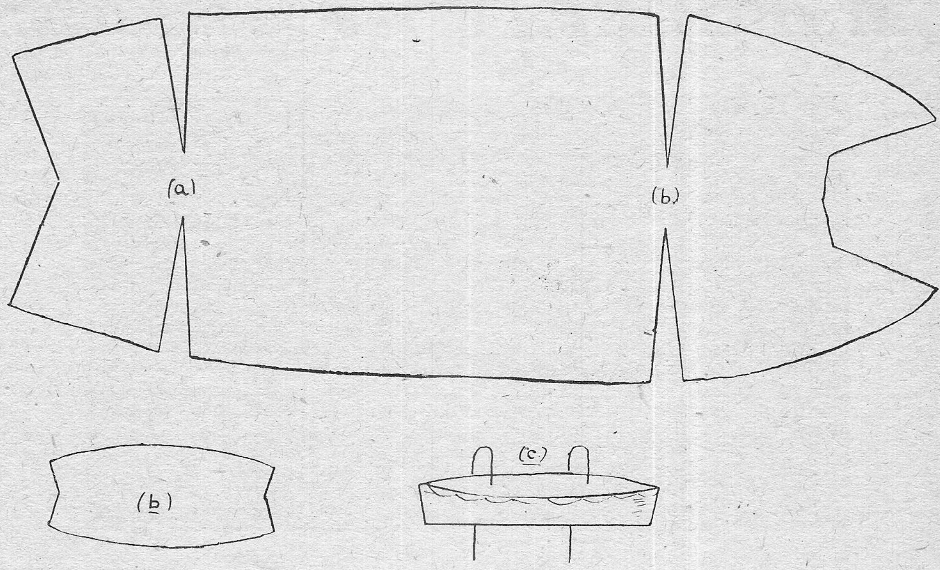


Fig. 1

balance the boat fore and aft by its own weight and therefore needed the boiler in the front, the spirit container at the back, with the motive power central. The next matter was the engine, and here something like a storm blew up!

Originally, a small oscillating engine had been decided upon, in a framework to hold several clock-gears. Gearing would be necessary, as the cylinder was very small in order to conserve the limited steam capacity of the boiler.

After some hours spent in planning and constructing the power plant, the time came for a test, in which the length of run could reasonably be judged, which, it was hoped, would amount to, say, twenty-five minutes. THE MODEL ENGINEER has pointed out on several occasions—the last fairly recently—that oscillating cylinders are wasteful of steam; so, perhaps, I should have been warned.

Anyway, inside a quarter of an hour, the boiler

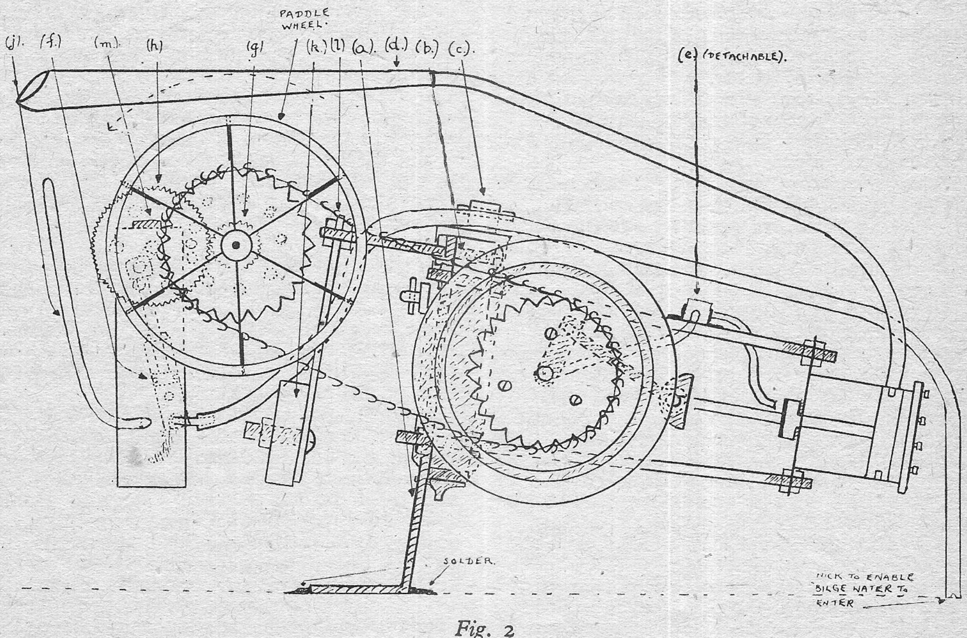


Fig. 2

was quite dry, and there was I punting round in a vain endeavour to concoct some means of increasing this, even if only for a few minutes!

Nothing could be done but install and just run for fifteen minutes each time, or scrap the engine and try something different.

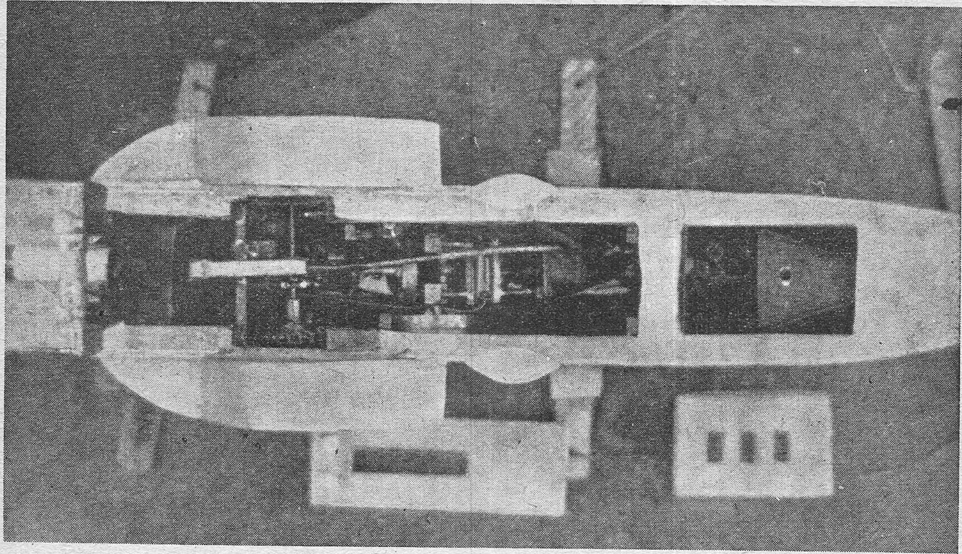
Then, a brain-wave! Months ago, whilst sorting through a stall in Farringdon Street, I came across an old horizontal double-acting engine in hopeless state, and I took it home and reconditioned it. A high-speed oscillating engine, as proved by the one made, used a lot of steam in a short time. Would it be possible to use a powerful double-acting slide-valve engine at low pressure and very slow speed, and conserve the steam?

The old engine was dug out, connected up to the boiler after a good clean up, set to "tick over" at about 120 r.p.m., and timed. It was still going after 30 minutes, and I could have kissed it!

That problem being solved, the next one was transmission of power to the paddle wheels, and as the engine is a large one for the length of the hull, being approximately $\frac{5}{8}$-in. bore by $\frac{3}{4}$-in. stroke and measuring $4\frac{1}{2}$ in. in length and $3\frac{1}{2}$ in. in width (including flywheel), it would have to be placed as low in the hull as ever possible, in order to be below the waterline when the boat floated and thus remove a certain tendency to capsize the boat.

The obvious solution was chain-drive, but where was the chain to come from? I hadn't seen any for months! Then, another brain-wave! Many old wireless sets used to have a chain-and-sprocket drive on their variable condensers, and, sure enough, at the first shop approached, they had just dismantled such a set and let me have the chain and sprocket (plus other sundries connected to it) for sixpence! An additional sprocket was filed out of brass (using the original steel one as a template), as I had now decided to "go the whole hog" and have nothing more to do with gearing. That brought the internal arrangements to a state of satisfaction and so the engine was set up.

The engine is held by one bolt only. Reference to Fig. 2 will show that a piece of brass (*a*) is bent to the shape shown, and soldered to the hull, and the engine bolted as at (*b*). Before bolting the engine into position, steam-pipes were fitted and a displacement lubricator, shown at (*c*) in Fig. 2, in which is shown, also, the arrangement of the exhaust (*d*), oil system for the engine (*e*) and the bilge-pump at (*f*). This latter deserves a little explanation, for it was made out of the cylinder originally intended to drive the boat ! As will be seen from the diagram, a pinion-wheel is attached to the paddle-wheel shaft (*g*), which, in turn, drives a gearwheel (*h*) in the ratio of roughly 3 to 1. At (*j*) is shown the bilge outlet pipe, which is taken through the starboard side of the boat on top of the sponson, and thus ejects the bilge direct into the pond.



Looking into the engine room

At (*k*) in Fig. 2, will be seen a somewhat unusual feature. This is a circular brass weight drilled centrally and attached to a strip of brass which in turn is bolted to the "engine bolt" at (*l*). This weight can therefore be adjusted from one side to the other in the final balancing of the boat, and is capable of very fine adjustment. Fig. 2 is not exactly to scale, but very nearly so. The paddle-wheel shown *is* to scale (half size).

The boiler was hung in a tinplate box with three vents cut on each side at the bottom of the box. Finally, a spirit container was cut to the shape of the stern resting on a step as shown in Fig. 3 at (*b*). This container has a hole drilled in its face with a piece of brass tube poked through so that the methylated level is correctly gauged.

A wooden plug prevents any leakage of spirit when the boat is in motion. The container is fitted with a drip regulator, as shown.

Now came the problem of a burner. I have read all the letters and articles on this matter recently published in THE MODEL ENGINEER and, as so many people have different ideas on the "poison-gas plants," I was very dubious on this point; but I made a simple lamp out of a piece of square brass tube from the junk-box; I cut a slot down the centre of the tube, turned the ends up and soldered them, the whole forming a spirit-box. Next, a piece of copper tubing was run through the end of the box, soldered to it; and the box was stuffed with asbestos string, and a piece of very fine-mesh metal gauze inserted in the slot. On the far end of the copper tube was fitted a piece of rubber tubing, the other end of which was attached to the drip-feed screw-valve.

A glance at the agenda showed that the paddles were next, and it is just as well that Mr. Victor B. Harrison had not begun his "Two Miniature Paddle Steamers" article by then, or I should have been in an absolute dilemma, not, at that time, thinking performance would be marred if feathering paddles were omitted. I love feathering wheels on the real article, but had I thought it essential to make them on a miniature boat, with visions of the time required to make them, my little effort would have gone straight into the dustbin. Mr. Harrison is to be congratulated most sincerely on having succeeded in turning them out on his extraordinarily good boats; but they are beyond my capabilities.

Anyway, to get back to the point. The first idea was to make an 8-paddle wheel; but, as I was anxious to cut out any work which seemed superfluous, a figure of 6 was more appealing, and this was approved. Four circles of brass sheet were cut out, and two of them scribed for six spokes, each being roughly cut, and then clamped together for final filing. Two pieces of brass tube were cut to be used as spacers. The spoked wheels were brought to the outside and the two remaining brass discs were left on the hull side. It was not thought necessary to cut the *four* discs into spokes, (*a*) because the inside ones would not be seen much anyway, and (*b*) because a much more rigid wheel would result if the back part of the wheel was left solid.

Twelve strips of brass sheet were then cut and filed to exact size, each $\frac{7}{16}$ in. × 1 in. and soldered between the spoked and the plain brass discs, which were then soldered to the spacer; after that, both wheels were put on one side for the time being.

Now came quite a problem—fitting the main paddle-shaft. With such thin metal for the hull two bearings were essential, and were made from brass rod. Two holes were drilled in the hull and a piece of steel rod inserted through one hole, one bearing, a sprocket wheel, and collar therefor, a pinion-wheel, and then the other bearing added before threading the rod through the hole on the opposite side of the hull.

Now we were nearly ready for steam trials; but I experienced Mr. Harrison's difficulty about binding of the paddle-wheel shaft. This was overcome by laying a stiff piece of brass plate transversely across the hull and about 1 in. in front of the shaft and soldered firmly to the sides of the hull. This "beam" is shown at (*m*) in Fig. 2, and, incidentally, was used for supporting the oscillating bilge-pump. The engine and lamp were now tested as a compact unit, starting from cold; the lamp burned reasonably well and the engine turned over excellently. More fun and games began when the engine was introduced into the hull, for, each time the hull was lifted, the metal took a slightly different shape, having no lateral strength; and after the bearings had been soldered inside the hull, whilst the boat was resting in one position, any change in that position caused shaft binding again! Obviously, there was no point in unsoldering the bearings, changing position, and resoldering, for the same trouble would recur *ad infinitum*.

(To be continued)

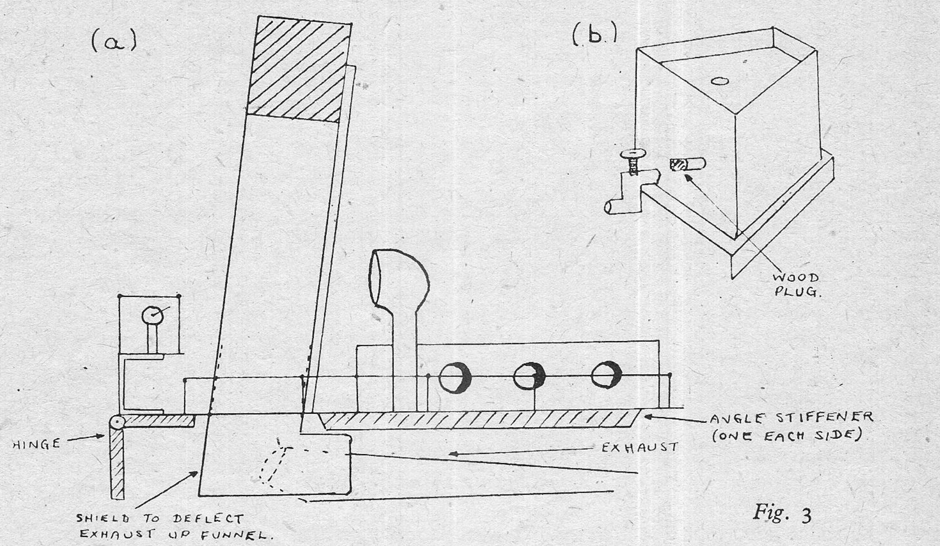


Fig. 3

Clubs

The Society of Model and Experimental Engineers

The next meeting will be held on Saturday, January 19th, at 39, Victoria Street, Westminster, S.W.1. On this occasion the prizes won during the last session will be awarded. This will be followed by a talk by Mr. K. N. Harris on the lathe he has designed and built.

Secretary: J. J. PACEY, 69, Chandos Avenue, Whetstone, N.20.

I.W. Model Engineering Society

Our activities at the moment have only been monthly meetings—the last including a talk on our local railway system, etc., by a locomotive driver (member), but already a "live steam" afternoon is planned for the near future.

We have sustained a great loss in the sudden death, as a result of a motor-cycle accident, of Arthur J. Cunnington, formerly our chairman. One of the founder members, he did more than anyone to make our Society a success and was always very helpful to those who sought his advice on the "finer points."

I understand that before coming to the Island he was a member of the Victoria M.P.B. Club, London, and he had built, while here, boats powered by I.C. and steam engines. His special interest lay in sailing ship models, where his knowledge of detail was very wide ("expert," in fact!) and his craftsmanship of a very high order.

The office of chairman is now filled by Mr. Geo. McClure, whose own interest in ship models was aroused by A.J.C.

Our future programme is in course of preparation—the exhibition at Easter is already scheduled!

Hon. Sec.: VICTOR RICHARDS, 13, Chapel Street, Newport, I.W.

Leeds Model Railway and Engineering Society

The Society will meet on Sunday, January 20th, at the premises of Mr. F. Cook, Kidacre Street. The meeting will be devoted to demonstration of the new brazing apparatus, also the construction of additional lengths of rail for the miniature railway. Members are asked to give a good turn up and come prepared to give useful assistance.

Hon. Secretary: J. W. SEYMOUR, 12, Outwood Walk, Horsforth.

Glasgow Society of Model Engineers

The next meeting will be held on Saturday, January 19th, 1946, at 7 p.m., within the rooms of the Masonic Hall, 100, West Regent Street, Glasgow, C.2 (engaged for the occasion). At this meeting, which will take the form of a film display, N. Duncan, from Saltcoats, will show films of events of particular interest to power-boat enthusiasts. The presentation, however, will have a wide appeal, and it is anticipated a large attendance may be looked for.

The Society is indebted to the Ayr S.M.E. and certain of its members for their co-operation in making this film night possible.

Work on the railway site is progressing, and is well up to schedule.

A visit has been arranged to Clydebridge Steel Works (Messrs. Colvilles Ltd.), for February 7th, 1946, at 7 p.m. All particulars direct from the Secretary.

Visitors will be welcomed and particulars of membership can be had from the Hon. Secretary: JOHN W. SMITH, 785, Dumbarton Road, Glasgow, W.1.

Coventry Society Model and Experimental Engineers

Our activities, suspended during the war, due to the loss by enemy action of the workshop and equipment, have now been resumed.

The Annual General Meeting and election of officers took place on December 14th, 1945. A programme of twelve monthly meetings was drawn up, commencing on January 18th, 6.45 p.m., with a lecture on "The Processing of Nylon," by courtesy of Courtaulds Limited.

Hon. Secretary: J. F. BACK, 3, Macaulay Road, Stoke, Coventry.

The Bristol Society of Model and Experimental Engineers

Our meeting on December 22nd was a purely formal one, to discuss the final details of the exhibition being held at The Bristol Museum and Art Gallery, till January 19th.

The next meeting will be held on January 19th, at the Black Horse, West Street, Old Market, at 6 p.m.

Hon. Sec.: C. C. LUCY, 28, Bibury Crescent, Henlease, Bristol.

The Medway Model and Experimental Engineering Society

The first general meeting will be held on January 22nd, 1946, at 7 p.m., at The Masonic Hall, Manor Road, Chatham, Kent; all members and intending members are requested to attend. Anyone interested in model work is invited to get in touch with the Secretary, F. E. HOWLETT, 59, Bryant Road, Strood, Rochester, Kent.

Corrigendum

In our review of the brochure, "*Our* Railway Histories," by Boyd-Carpenter and Pearson, the price was stated to be 3s. 6d. This should be 5s. 6d.

We understand that a second imprint of this handsome booklet has been necessary, so that any reader who wishes to obtain a copy is advised to make early application to Mr. V. Boyd-Carpenter, Launt House, Worksop, Notts.

NOTICES

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects. Matter intended for publication should be clearly written, and should invariably bear the sender's name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All correspondence relating to sales of the paper and books to be addressed to Percival Marshall and Co. Ltd., Cordwallis Works, Maidenhead, Berks.

All correspondence relating to advertisements to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," Cordwallis Works, Maidenhead, Berks.

"THE MODEL ENGINEER" SALES AND WANTS

Private: **Threepence** *word*. *Trade*: **Sixpence** *word*. *Use of Box* **2/6** *extra*. *Minimum charge*, **3/-**

TOOLS & WORKSHOP

Buck and Ryan's Department for Lathes, Drilling Machines, Grinders, Electric Tools, Chucks, Surface Plates, Lathe Accessories and Tools.—310-312, Euston Road, London, N.W.1. Telephone: EUSton 4661. Hours of Business: 8.30 to 5.0 p.m., Monday to Friday; Saturday, 1.0 p.m.

For Consistent Quality, friendly service and prompt deliveries—GARNERS, Sheffield Road, Barnsley. 'Phone 2866.

Split Chucks for watchmakers lathes, 6 mm., 6½ mm., and 8 mm., 6s. each; Step Chucks, set of five, £2 17s. 6d. Draw in Spindles, 12s. 6d. each. Postage extra 6d. Larger chucks made to order.—JOHN MORRIS (CLERKENWELL) LTD., 64, Clerkenwell Road, E.C.1.

Taps, Dies, Reamers and Drills. Largest stock in the North.—GARNERS, Sheffield Road, Barnsley. 'Phone 2866.

Various Flypresses, Tinsmiths' Machines, Polishing Spindles, Lathe Beds, Rotary Blowers, Centrifugal Pumps, Bench and Pillar Drilling Machines, Light Horizontal Milling Machines, Wood-turning Lathes, etc.—H. KNAPTON (MACHINE TOOLS) LTD., Friston Street, Ladywood, Birmingham.

Your Myford Specialists, 100 per cent. replacements service.—GARNERS, Sheffield Road, Barnsley. 'Phone 2866.

Machines Offered at Ridiculous Prices to make a clearance at our Works, £75 each. 2 Herbert No. 4 Boring and Facing Turret Lathes. All geared heads. Single pulley drive. 2 Herbert No. 1 Turret Lathes. All geared heads. Single pulley drive. 1 Warner & Swasey, 1¼" cap. Back geared. 2 Cleveland Autos, ⅝" cap. 1 Wuttig Auto Screwing Machine, with slotting device, 8 mm. 1 Jackson Die Sinker, table 48" × 14". 1 Churchill Plain Cylindrical Grinding Machine. Cap. 50" × 7". 1 Landis Cylindrical Grinder, table 6" × 24" (damaged). 1 Butler 18" Shaper (damaged). 2 Fromm Motorised Routers, 220/1/50 cy., 16" Rotary Tables. 1 9" Yorkshire Type Centre Lathe. 1 5-ton Mossburgh Power Press. 1 Universal Combined Vertical Milling Machine and Slotter. 1 Archdale Milling Machine, table 30" × 10". And many other machines offered at low prices. Ex Works to clear.—WINCHESTER ENGINEERING, 294/6, Lillie Road, Fulham, S.W.6. 'Phone: Fulham 6351/3081.

Silver Steel Rounds, Squares, Asbestos Sheet, String, Rounds, Squares, Hexagons, Flats, Angles, Sheet, Tubes in B.M. steel, brass, copper, 3/32", ⅛", 6 B.A.R. head screws, nuts, rivets, silver solder. S.A.E. for lists. Please note new address.—R. & B., Keresley Road, Radford, Coventry.

Super Adept, 1⅝", compound rest, treadle, driver plate, faceplate, angle-plate, tools, 4-jaw chuck, £6 or offer.—Box No. 3860, MODEL ENGINEER Offices.

Oxy-acetylene Set — Regulators, torch, goggles, £8; slide-rest grinding attachment, suit 5"-6" lathe, 40s.; machinist's tilting table, T-slotted, 8" × 4", graduated, two-way tilt, 65s. Wanted small compressor.—THOMSON, 110, Manor Way, Mitcham, Surrey. Pollards 5848.

Wanted, 2½" to 3½" Lathe, reliable make. Not less than 10" between centres; compound slide-rest.—BRIGGS, 2, Chatsworth Avenue, Bishop Auckland.

Wanted, 3⅜" Milnes R Bench Lathe in first class condition. If desired would part exchange 4½" screw-cutting lathe, well equipped and cash adjustment.—Box No. 3865, MODEL ENGINEER Offices.

Corbett's (Lathes), Stanton Hill, Mansfield, offer Lathes; Lathe and Drill Chucks, Electric Motors, high speed and Wimet tipped carbide lathe tools, 0-½" capacity five speed power bench drills, Wolf portable drills, treadle and electric grinders, vices, bench and machine, six hole leather punches. Copper tube, sheet, rounds, hexagons, silver solder, brazing blowlamps, etc. State requirements and include S.A.E. for lists.

For Sale, Complete Workshop, 3½" super Myford Lathe, V-Rope motorised; ½" Union Drilling Machine, motorised; combination Grinding Head, motorised. All accessories. Drills, chucks, bench, etc.—SMITH, 163, Fairfield Road, Buxton, Derbyshire.

Wanted, Metal-turning Screw-cutting Lathe, about 9" × 24", good condition.—LOWTHER, 44, Barburry Drive, Moredon, Swindon, Wiltshire.

Wanted, Stand and Treadle complete for 3½" Drummond, flat belt.—GOATCHER, East Street, Petworth, Sussex.

For Sale, George Adams 3" B.G.S.C. Lathe, 4½" independent chuck, faceplate, set change wheels, countershaft, hangers, cone, and 7½" pulleys. Perfect condition, £15 10s.—FLETCHER, 15, Southdown Road, Newbury.

Wanted, Ornamental Turning Slide-rest, 9/16th box, suitable for use on a Myford 3½" lathe.—395, Wandsworth Road, S.W.8. MAC 1465.

Adept No. 2 Hand Shaper, new, £14; Milnes 3⅜" dividing head and tail centre, complete, new, £20; Flat Lathe Bed, 3' 6" × 3⅜", planed, new, £4; Recored Multi Plane, No. 405, two irons missing, perfect, unused, £3; Electric Hand Tool, pistol grip, 230 A.C., 20,000 r.p.m., complete with case of stones and files, £9; Levis M.C. Engine, O.H.V. 250, perfect, £5; Barr & Stroud 250 Sleeve Valve Engine, mag. gear missing, £4; set of Brownie Mikes, 0 to 4", inside and outside, in case, £7.—EVANS, High Street, North Tawton, Devon.

Genuine Stainless Steel Rods, ⅜" diameter, 2¼" long, 6d. each, post free.—"Halcyon," Reservoir Road, Elburton, Plymouth.

Collet Attachment and Collets wanted for Drummond 4" round bed lathe. Good price paid.—Box No. 3868, MODEL ENGINEER Offices.

Myford 3½" ML2 Chucks, accessories, shafting, motor. Callers preferred, £35.—FOSTER, 4, Thompson Avenue, Ormskirk.

4" Centre Britannia Lathe, fully compound rest, self-centring chuck and tools, £12, exchange 3" back geared bench lathe, locomotive any gauge, or out of order will do.—KIGHTLEY, 2, Harringay Road, London, N.15.

Myford 3½" B.G.S.C. Lathe, latest, with new type tailstock, tumbler reverse, fixed and travelling steadies, swivelling milling slide, 4" S.C. and 4" 4-jaw chucks, dial indicator, 4 tool turret, vee rope drive. Lathe used less than 100 hours. Most accessories unused. Offers. Prefer exchange for ML 5 or ML 6 Myford capstan if in perfect condition, Sussex preferred.—Box No. 3876, MODEL ENGINEER Offices, or 'Phone evenings: Warninglid (Sussex) 214.

American Atlas 3" Model 612, S.C.B.G. Lathe, steel stand, 4" Universal Chuck, full set gears, faceplate, tools, etc., £35.—Box No. 3870, MODEL ENGINEER Offices.

"George Adams" 2½" Precision Lathe, accessories, fitted stand, £75; Woodcarver's Set, oak case, £30; Historical Engineering Books. Offers.—PICKARD, 4, Morland Gardens, Southall, Middx.

A limited quantity of small Sparking Plugs, approx. 1⅛" long, threaded ⅜" × 24 t.p.i., tested, suitable for small engines. Each 5s., postage 3d.—L. LITCHFIELD, Broadholme, Belper.

Exchange, B.S.A. .177 Air Rifle, rifled bore, for Super Adept.—Box No. 3875, MODEL ENGINEER Offices.

MODELS & FITTINGS

Apex Minor (Mr. Westbury's design) engine castings, also carburettor castings "M.E." June 14th issue. Delivery from stock. Also spiral timing gears. New Atom Minor 6 c.c. (Mr. Westbury's design). Patterns and castings in preparation. Orders booked in strict rotation. Trade enquiries invited.—THE HEADINGLEY MOTOR & ENGINEERING CO. LTD., 8, Otley Road, Leeds.

Wanted, 1½" scale Locomotive, must be in running condition. Cash. Send full details to—DAVID ROSE, 1617, Old Oak Road, W.L.A.24, Calif., U.S.A.

Amateur Astronomer wishful to taste the joys of model engineering, would exchange his Giant 10" Aperture Telescope, length approx. 8 feet, on cast iron stand, with eyepieces, books, etc., worth about 100 guineas, for Garden Railway, or? All letters answered.—Box No. 3862, MODEL ENGINEER Offices.

Castings, Pattern Making, Machining, Drilling, Boring Boilers, Sheet Metal Work, of all descriptions. Send your requirements.—KEVA ENGINEERS LTD., River Road, Creeksmouth, Barking, Essex.

New, Stroudley Water Gauge, 12s. 9d.; Blower Valve, 5s. 9d.; Safety Valve Locomotive, 5s. 3d.—THOS. MCCRACKEN, 388, Main Street, Rutherglen.

125 Feet "O" Gauge Clockwork Track, 3 points, crossover, double junction, mostly new and unused; 6 volt Bassett-Lowke 4-4-2 Tank, Nettle Railcar, both Leeds mechanisms, offers over £15, or separately; 3½" gauge "Petrolea," frames assembled, wheels finished, castings for cylinders, smoke-box, eccentrics, etc., £5; ¼" Drilling Machine, £6; various M.E. tools, taps, dies, reamers, etc.; 18 volumes MODEL ENGINEER, 1936-1945, 16 bound, offers over £10.—SMITH, 1, Full Sutton Gates, Stamford Bridge, York.

Are you stuck, that tricky piece of machining, that hull that won't come right? Send it to us. A first class job at a reasonable price. No job too big or too small; 0" and ½" rolling stock built to order.—TAYLOR, 10, Mount Pleasant Road, Brixham, S. Devon.

Majesco "45" Miniature Aero-Motor (4.5 c.c.), die castings; all materials; detailed instructions; working drawings. Complete kit, 24s. (post paid).—MAJESCO MINIATURE MOTORS, 35, St. Flora's Road, Littlehampton, Sussex.

2½" Gauge 4-8-4 Locomotive for Sale. Tender finished in nickel silver, boiler almost finished, all other parts to complete, with blueprints, coal-fed model, £35. Call any night after 6 o'clock.—S. J. TAYLOR, 44, Bromley High Street, Bromley-by-Bow, E.3.

Boiler Brazing and Building Service. Boilers brazed or built to your own, or "L.B.S.C." specification, tested and guaranteed. Personal attention to all orders. Send stamped addressed envelope for quotation against drawing or sketch, and list of Easyflow, Silbralloy, etc.—CLARABUT, 6, Park Rd., Wembley.

First-class Scale "O" gauge 6 volt Model Railway, photographs on application.—HINDER, 10, Dallas Road, Chippenham, Wilts.

Now in Stock, 9/16" bore lightweight super Marine Engines, £3 10s.; 5/16" bore high pressure Oscillating Engines, £1 10s.; 16 gauge Copper Boilers, ends, and bushes spun in $2\frac{5}{8}'' \times 5\frac{1}{2}''$, 19s. 6d. + 2s. 6d. per inch on length; Safety Valves, 4s. 6d.; Steam Cocks, 4s. 6d.; Steam Taps, 4s. 6d.; Water Gauges, 4s. 6d.; Seating, 8d.; Union Nuts, 8d. Generous trade terms.—TONBRIDGE INSTRUMENTS, 13, Quarry Hill Parade, Tonbridge, Kent.

Stuart Turner B.B. Steam Engine, £3 5s.—15, Brothertoft Road, Boston, Lincs.

2½" Gauge 4-6-2 Chassis, complete, smokebox, chimney, lubricator, pump, etc. Ready for boiler, £32. S.A.E.—40, Sussex Road, S.W.9.

Castings, Non-ferrous to your own patterns.—JONES, "Portland Works," Newcastle Street, Burslem, Staffs.

"Lord Nelson" 3½" Gauge, prints, castings, etc., wheel castings, annealed gauges, 0-3½", S.A.E.—KENILWORTH MODELS, 90, Warwick Rd., Kenilworth.

Sale, Hallam 1.3 c.c. two-stroke Engine, with coil, plug, etc., £5 10s.—155, Chipstead Valley Road, Coulsdon, Surrey.

½" Scale Locomotive "Lord Nelson," engineer built, most excellent finish, coal-fired, needle control cocks, Walshaerts gear, fluted motion, no wear anywhere, seen appointment any time, Slough district, £100. First cheque secures.—Box No. 3871, MODEL ENGINEER Offices.

Boiler suitable ½" Scale Pacific. Usual fittings, £15; another same type, no fittings, £8 10s.; also L.M.S. 4-4-0 "Compound," 2½" gauge, nice condition. Best offer secures. Stamp.—135, Gleneagle Road, S.W.16.

For Sale, 98 c.c. Villiers 2-stroke Engine, running order, suit outboard motor, lathe, etc., Magdyno 6 volts for lighting, £5 10s. After 8 p.m. or Sunday.—JOHNSON, 14, Haselrigge Road, Clapham, London, S.W.4.

Wanted, First class 7¼" gauge Locomotive and Track. Write, giving full details to—Box No. 3872, MODEL ENGINEER Offices.

Two Compressors, twin cylinder, $2'' \times 2\frac{1}{4}''$ bore and stroke, hollow crankshaft, white metal bearings, water cooled head, 8" v belt drive flywheel, approx. 56 lb. weight. A real engineering job, £4 each (box and packing, 2s. 6d.), pay own carriage. B.S.A. Motor Cycle Engine, 1938 s.v. complete mag. amal. carburettor, as new condition, 500 c.c., £8, guaranteed, mechanically sound; foot change gearbox for above, less kick start lever, guaranteed order, £4 10s.; ass. drills, ⅛ to ¼, 40, take 10s. lot; pair self aligning Ball Race Blocks, take 1 shaft, £1; 3 lengths solid drawn Brass Tube, 2 ft. × 2½ ft. × 3/11, 6s. length.—A. W. LITTLEWOOD, 25, Hough Lane, Wombwell.

For Sale, Stuart Mill Engine and Boiler, No. 501, excellent condition, £8.—CLOUGH, "Lynleigh," Utley, Keighley.

Ship Modellers. Model Wire Ropes in Phosphor Bronze, .016, 6s. 6d.; .019, 6s. 9d.; .022, 7s.; .024, 8s. per 100 ft. coil; .020 galvanised, 5s. 6d.—DAVIES, 4, Dauntesey Avenue, Blackpool, Lancs.

GENERAL

Watchmakers Demobbed need Lathes to start work again. John Morris (Clerkenwell) Ltd., will pay high prices for Lathes by Lorch, Boley, Wolf Jahn, and American and Swiss makes.—64, Clerkenwell Road, E.C.1. CLE 6077.

Three Toolmakers Require Spare-time work, experimental or press tools.—55, Kew Crescent, North Cheam, Surrey.

Send for our 14 Page Catalogue of Tools and Materials, price 6d. Refunded on the first 10s. order.—THE "LIVE STEAM" Co., 7, Greenways, Hertford.

Watch and Clock Making. If interested you can get all tools and parts also wheels cut from—JOHN MORRIS, 64, Clerkenwell Road, E.C.1. Regret no posts or lists, only counter service at present.

Toys, Models and Novelties. Book of designs with instructions. 50 illustrations. Popular number, 2s. 6d., post free.—HARROD (M), 10, Beaconsfield Road, Maidstone.

Greenly's "Model Engineering," 25s.; Greenly's "Model Steam Locomotives," 25s.; recent MODEL ENGINEERS, 35s.; Wheels for Atlantic Locomotive, 3½" gauge, 25s.; Mechanical Lubricator, unused, 30s.—Box No. 3858, MODEL ENGINEER Offices.

Skilled Photographic Instrument Repairers Required, used to up-to-date shutter mechanisms, permanency for the right men. Apply—BAXTER, 171, Victoria Street, London, S.W.1. 'Phone, Victoria 0802.

Wanted, Detail drawing or complete mechanical lubricator for 1½" scale model "Royal Scot." Highest price paid.—WINSLOW & SON, 5, Aylesbury Road, Thame, Oxon.

Metal Moulds for Lead Toys, deep cut, supplied in over 200 latest designs. Satisfaction guaranteed. S.A.E. for lists.—AGASER, 7, Stradbroke Road, London, N.5.

For Sale, Two volumes "Railway Wonders of the World." No reasonable offer refused.—H.J., 25, Granton Ave., Upminster, Essex.

Sale, MODEL ENGINEERS, Jan.-Nov., 1933; also vols. 84 to 92—few missing. Reasonable offer accepted.—ADAMS, 8, Cranbourne Road, Heaton Moor, Stockport, Cheshire.

Wanted, MODEL ENGINEERS from 1906-1920, complete, or odd copies, state price.—Box No. 3861, MODEL ENGINEER Offices.

Sale, Tannoy sound system, comprising powerful 6 valve amplifier in portable cabinet, with Gerrard motor, pick-up and 12" turntable with auto-stop. Separate speaker, microphone and H.T. generator. Operates from 12 v. car battery. Suitable for public address or entertainment. New valves. Bargain, £35. Wanted, microscope.—Box No. 3863, MODEL ENGINEER Offices.

Sale, Leitz Prism Glasses, 7 × 50. Both eye-pieces adjustable, superb definition, £20. Wanted, Astro Telescope Speculum.—Box No. 3864, MODEL ENGINEER Offices.

Rustproofing. Compound for Rustproofing by the Zinc Sherardising Process, Instructions included, 1s. 3d., post free. Alternatively, we rustproof your components by the above process, 1s. 0d. lb.; 5 lb., 3s. 0d., post extra.—DOLBY, Charnwood Road Works, Shepshed, Leics.

Car Thermometers, pre-war (Smiths Instruments), dash reading, flushfitting, give immediate warning of engine trouble, etc., 35s., new.—TEDDINGTON ENGINEERING Co., High Street, Teddington, Mddx. Kingston 1193-4.

Sale, 2 Micrometers, "Keilpart," 0-25 mm., new in cases. Passameter S.H. (Zeiss) 0-18 mm., reading .0002 mm. Best offer all or separate.—Box No. 3866, MODEL ENGINEER Offices.

Iolanthe Radiator. Burns paraffin or T.V.O. Complete, but needs attention, £3.—ILLINGWORTH, White House, Penrith.

Wanted, Clean copy MODEL ENGINEER No. 2317 (Oct. 4th, 1945).—STEEL, "Hardy," Lyons Lane, Appleton, Warrington.

Accommodation Required homely household, North Surrey, with garage or nearby facilities by business gentleman interested model engineering. Part bedding supplied, also references.—Box No. 3867, MODEL ENGINEER Offices.

What Offers? Clean MODEL ENGINEER, 2219 to 2324; "Mechanics," 113 copies; "Practical Mechanics," 50 copies; American "Mechanix Illustrated," 20 copies.—EDDON, Homeleigh, Marfleet, Hull.

Wanted, Blueprints or MODEL ENGINEER describing the building of "L.B.S.C.'s" "Fayette."—C. H. BOND, 83, Chudleigh Road, Twickenham, Middx.

Autotrope Gramophone Record Changer Chassis, mainly polished aluminium, weighs about 100 lb. Requires A.C. reversing motor and skilled attention, £15, no offers.—Box No. 3869, MODEL ENGINEER Offices.

Beam Compasses, 10s. 6d. each, including postage. High class instruments for draughtsmen and students, hitherto unobtainable. Remittance returned if not completely satisfied.—R. ELLIOTT, 65, Ailsa Avenue, St. Margarets, Twickenham.

9.5 mm. Motorised D.C. or universal Projector wanted, good condition, price, type, etc., to—I. H. STEWART, 4, Belmont Avenue, Belfast.

Modeller's Scaled Rule, brass, 12" long, engraved 7, 4, 3½ and 2 mm. scales; indispensable to the model engineer, 2s. 6d., post free; "Cardboard Rolling Stock and How to Build It,'" 2s. 9d., post free.—E. RANKINE GRAY, 691, Christchurch Road, Boscombe, Hants.

Wanted, Buy, or Loan, MODEL ENGINEERS, numbers 42 to 60, or Bound Volumes 4 and 5.—THORPE, 2, Pasture Place, Leeds 7, Yorkshire.

ELECTRICAL EQUIPMENT

A.C. Motors, 1/50th h.p. to 10 h.p., from stock; also D.C.—JOHNSON ENGINEERING, 86, Great Portland Street, London, W.1. Museum 6373.

Electradix Bargains include:

Dynamo and Motor Generator Bargains. G.E.C. double current Dynamos, 6 volts, 5 amps., 600 volts, 80 m.a. ball-bearings, 17 lb., as new, 37s. 6d., carriage paid, 5s. refunded on returned packing case.—Below.

Small D.C./A.C. Motor Generators by leading makers for use in Radio Receivers to take the place of H.T. battery, 6 volts input, 110 volts, 15 m.a. output, or 12 volts input, 230 volts, 30 m.a. output, £3 15s., weight only 5½ lb., size $5\frac{1}{2}'' \times 3\frac{1}{2}'' \times 3\frac{1}{2}''$, model finish, ball-bearings, 2-comms., 2 separate windings, waterproofed.—Below.

Transformers, 3 K.W. Crypto, 230 volts to 115 volts, 28 amps., £9 10s., to small Bell Transformers, 230/3/58 volts, 7s. 6d. Transformers for Rewind, 3 K.W. with stampings $4\frac{1}{2}'' \times 6'' \times 7\frac{1}{2}''$, windings damaged by blitz, weight with damaged wire, 65 lb., 45s., carriage extra.—ELECTRADIX, 214, Queenstown Road, London, S.W.8.

Brand New A.C. Motors, 200/250 volts, high starting torque, ¼ h.p., £5; 1/3 h.p., £5 10s. All sizes available.—JOHN STEEL, Bingley, Yorks.

Wimshurst, 1½ spark, 16s. Shunt Drum Dynamo or Motor, new, nice job, 6 v., 1 A., 20s., self start motor, one cell. Charge discharge ammeter to 10. Photo Balance and Weights boxed. Each good, post free, 5s.—35, Malvern Road, Weston-super-Mare.

Sale, ⅛ h.p. 240 v., 50 c. A.C. Motor, £3 or near offer.—WHYMARK, 'Penzance,' Parkeston Road, Dovercourt, Essex.

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